ELECTRICAL REVIEW

FRIDAY
1 DECEMBER 1961

WEEKLY
PRICE 1s 6d

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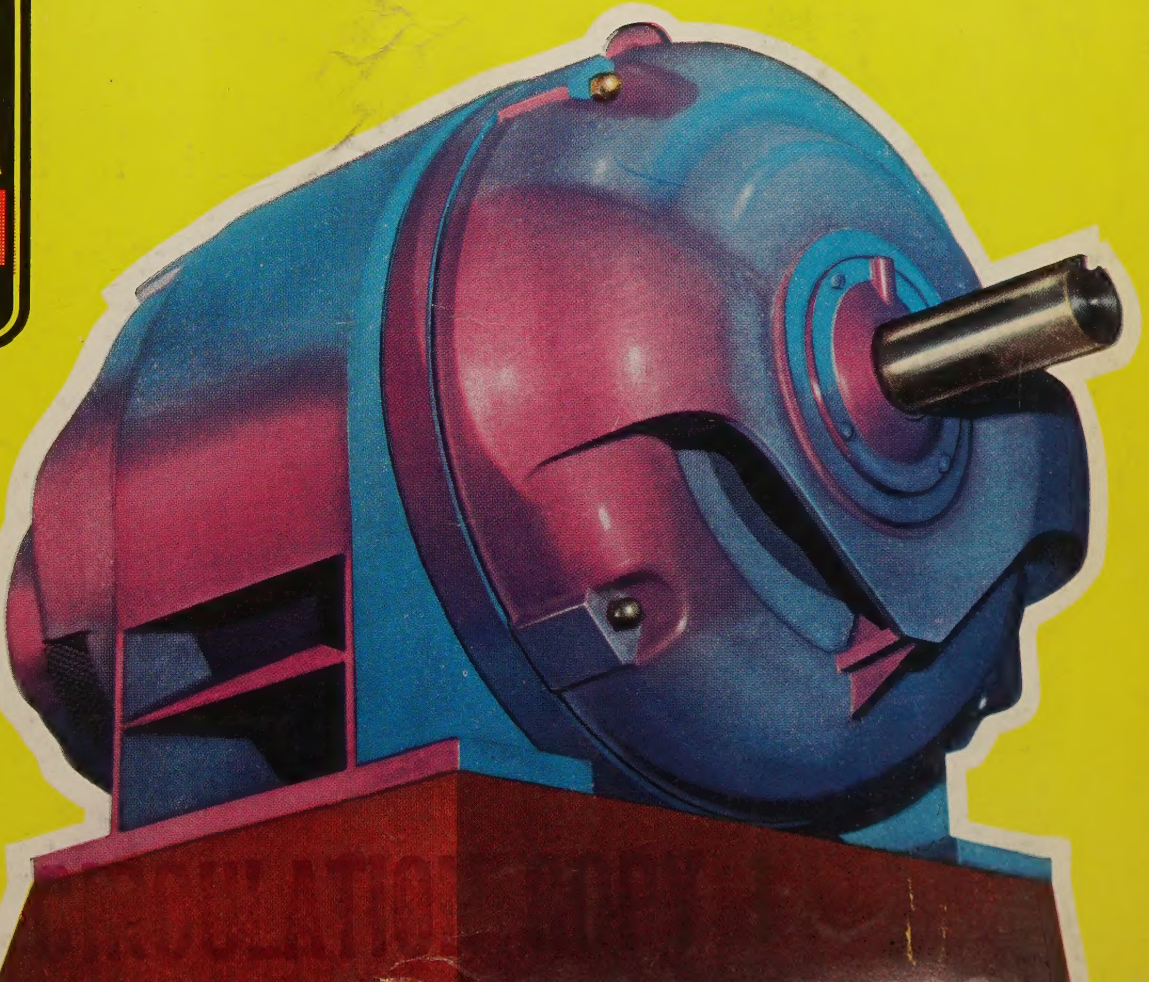
Serial Record

POWER

1/25th to 650 horsepower

BROOK
ELECTRIC
MOTORS



BROOK MOTORS LTD.
HUDDERSFIELD

CIRCULATION [illegible]

E.D.C.C. & SAFETY AT SEA

Special motor-alternator set providing a three-frequency output.

The custom-built Triple Frequency Generator supplied for the Trinity House Experimental Station at Dungeness is yet another example of Electro-Dynamic special purpose equipment. This generator is used for energising experimental fog-signalling equipment. It comprises three alternators in a common casing, having 16, 22 and 28 poles respectively and is driven by a 2-pole induction motor, through a magnetic-particle type coupling and flywheel.

E.D.C.C. are manufacturers of:

- Dynamometers
- Rotary convertors
- Flame-proof marine motors
- Frequency changers
- Induction regulators
- Single and polyphase alternators
- HF alternators
- Voltage stabilisers
- Rotary transformers
- Battery traction motors
- D.C. generators
- Magnetic couplings,
- Control gear, etc.

ELECTRO-DYNAMIC

CONSTRUCTION COMPANY LIMITED

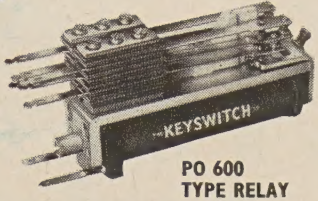
ST. MARY CRAY ORPINGTON KENT TELEPHONE: ORPINGTON 27551 TELEGRAMS: ELEDAMIC ST. MARY CRAY

Control Gear Division: Bridgwater Somerset Telephone: Bridgwater 2882 Glasgow Office: 40 Houldsworth St C3 Telephone: Central 2620

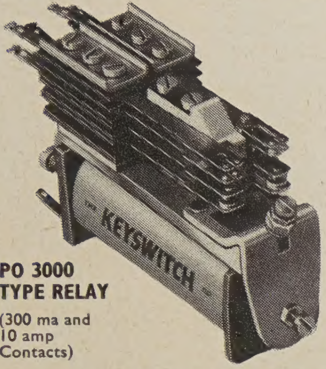
P.5657

RELAYS

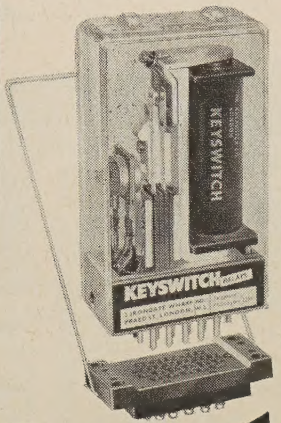
RELAYS EX-STOCK
AND READY NOW!
3000 Type Relays 6 to 60 volts
2, 4 and 6 change overs
OFF THE SHELF!



PO 600
TYPE RELAY
(Minor)

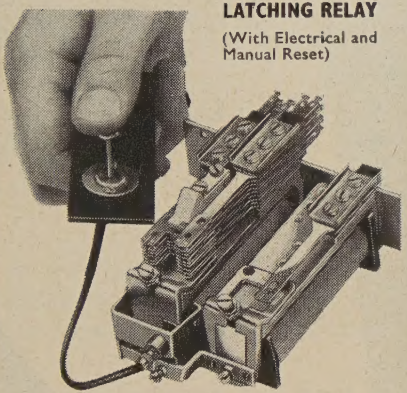


PO 3000
TYPE RELAY
(300 ma and
10 amp
Contacts)



PLUG IN
3000 TYPE
RELAY
(Moulded
Cover and
base)
With
transistorised
amplifier

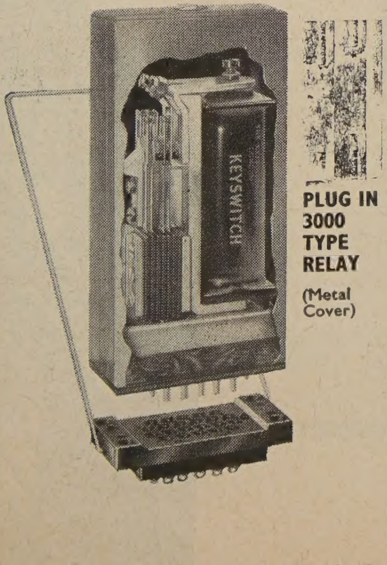
KEYSWITCH RELAYS



LATCHING RELAY
(With Electrical and
Manual Reset)

SILENT
A.C. RELAY
CONTACTOR
(Switching
30 amps)

(240 volts A.C.)



PLUG IN
3000
TYPE
RELAY
(Metal
Cover)

Manufactured as required for customers' own applications in:

AUTOMATION • COMPUTERS • TELEPHONE and INTERCOM SYSTEMS • BATCH COUNTING and PHOTO-ELECTRICS • MOTOR and MACHINERY CONTROL • AUTO-TIMING and AUTOMATIC SIGNALS • CURRENT and VOLTAGE REGULATION, etc.

Calculator providing full Relay Specifications is available FREE on request

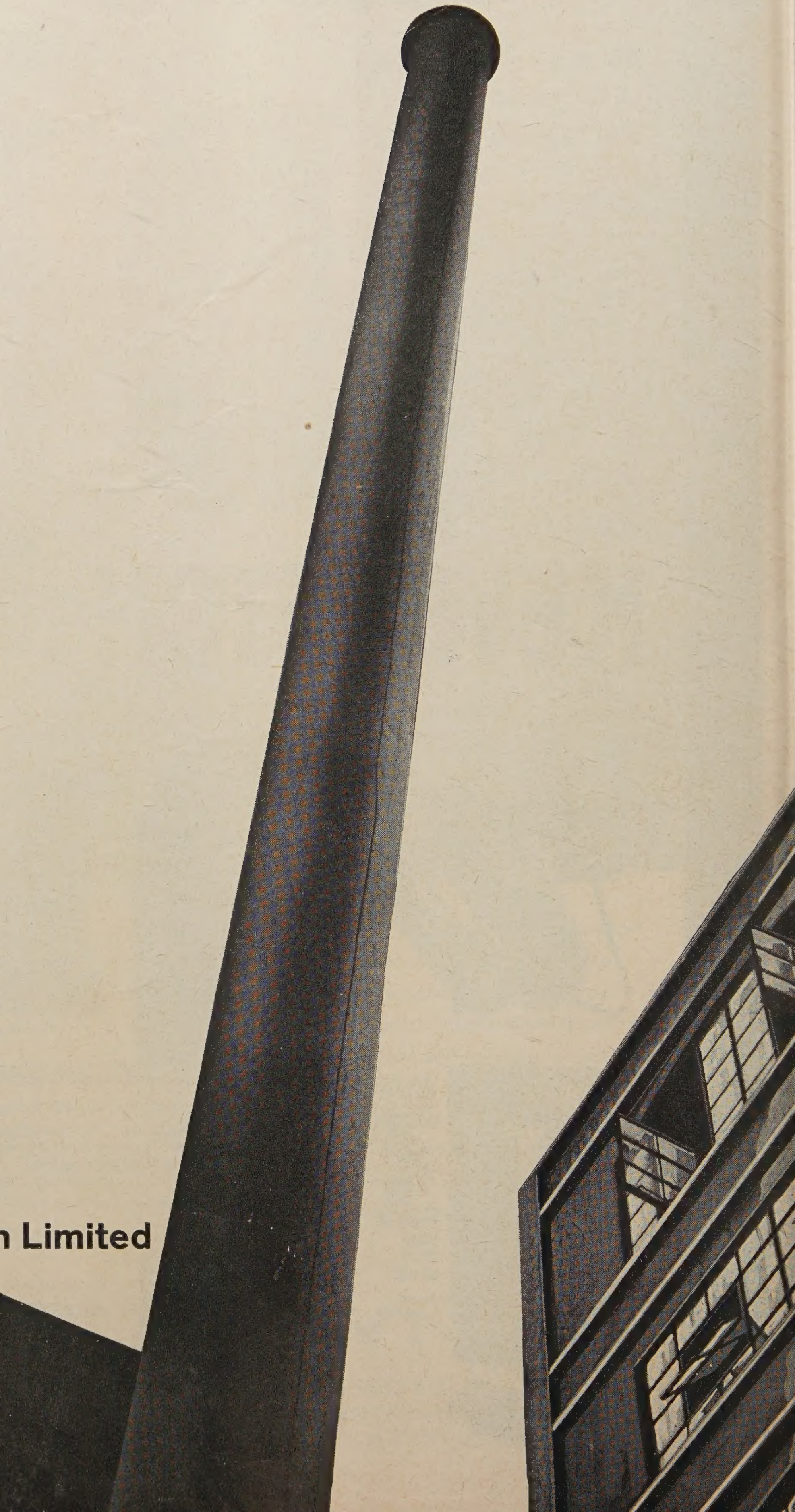
Contact Sales Director

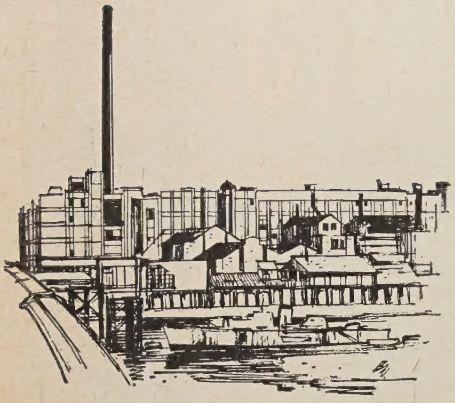
KEYSWITCH RELAYS LTD
IRONGATE WHARF ROAD
PRAED STREET, LONDON, W.2
Telephone: PADdington 2231 (6 lines)

Extremely advantageous quotations and delivery can be offered for quantity orders.

IT
REALLY
STANDS OUT

(There are 273 feet of it)*





*

Add a hundred feet or so to Nelson's Column and you have the height of the famous Morgans chimney at Battersea. Surprising what a little investigation can bring to light. Take what is produced at the foot of the chimney—take MORGANITE carbon. Carbon in ships, carbon in trains, carbon in motor cars, carbon in aircraft; carbon in electrical generation; carbon in current collection; carbon in washing machines and vacuum cleaners; carbon in telephones, pumps, radios and refrigerators; atomic carbon, mechanical carbon, electrical carbon—always carbon is somewhere at work. In the last fifty years, we have put carbon on the map. We have adapted it to the needs of so many industries that now our MORGANITE carbon products are known throughout the world. Their quality, reliability and consistency are outstanding.

Morganite Carbon Limited

A Member of The Morgan Crucible Group

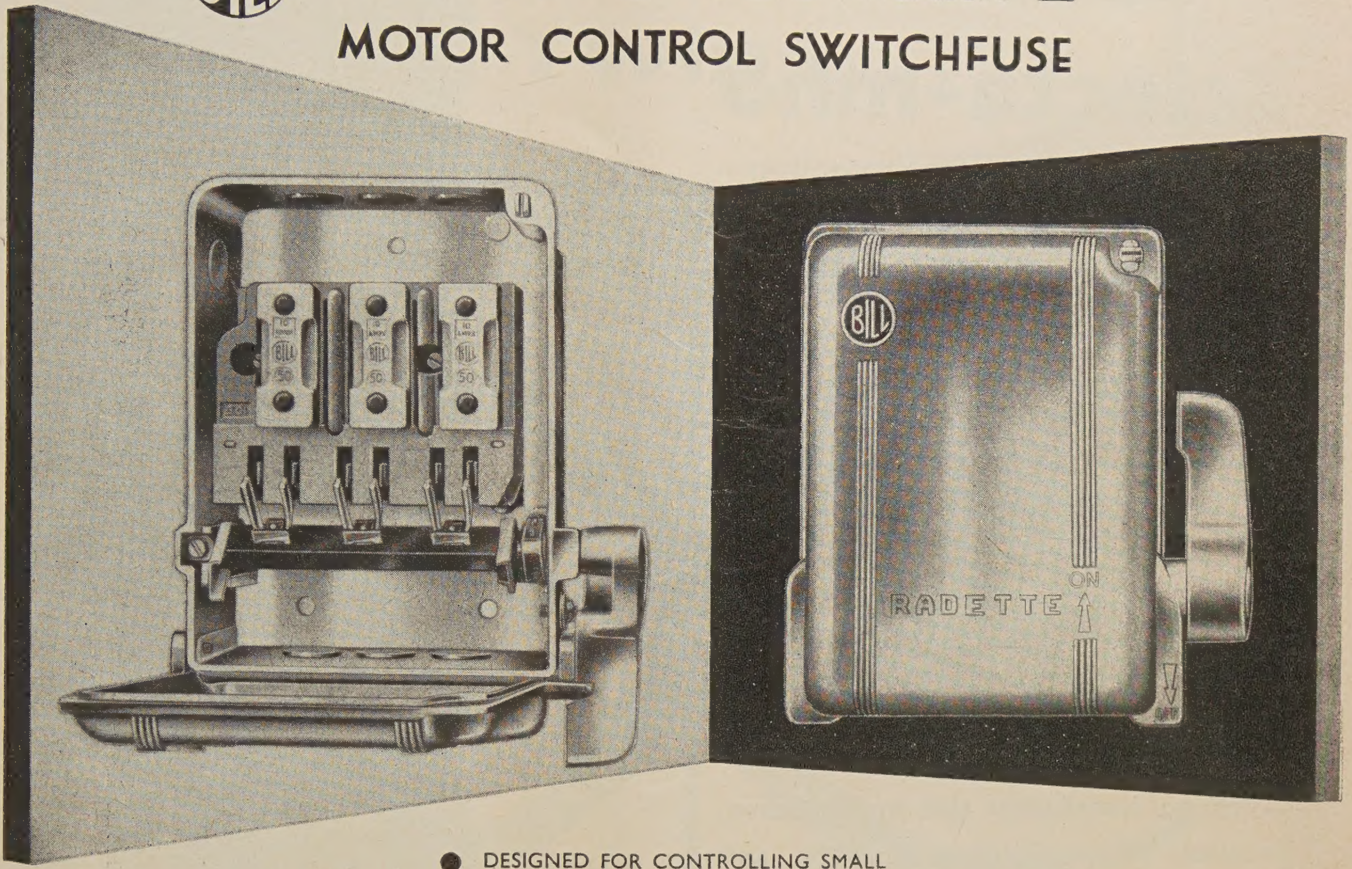
Battersea Church Road, London, S.W.11
Battersea 8822

C62A/797

YOU CANNOT BUY BETTER GEAR

You cannot buy better gear

BILL RADETTE Q1438 MARK II
MOTOR CONTROL SWITCHFUSE



- DESIGNED FOR CONTROLLING SMALL MOTORS NOT EXCEEDING 5 H.P.

- 10 AMPERE 500 VOLTS, 3 PHASE, QUICK MAKE AND BREAK SWITCH WITH SUBSTANTIAL CONTACTS FOR HIGH CONTACT EFFICIENCY AND LONG LIFE

- BILL ARC DAMPING TYPE FUSES FITTED COMPLETE WITH FUSE WIRE BY QUICK ACTION CLAMPS

- AMPLE KNOCKOUTS AND GENEROUS WIRING SPACE PROVIDED. 3—¾″ KNOCKOUT HOLES TOP AND BOTTOM. 1—¾″ KNOCKOUT HOLE IN LEFT HAND SIDE FOR STARTER CONNECTION.

- 'THROUGH' WIRING ARRANGED UNDER THE SWITCH BASE

- NO DISMANTLING OF SWITCH MECHANISM IS NECESSARY

- SOLID FORTOL BRUSH BAR TO ELIMINATE EARTHING

- FINISHED IN BILL SILVERLOSE— A DURABLE STOVED ALUMINIUM ENAMEL

BILL SWITCHGEAR LTD.
ASTON LANE · PERRY BARR
BIRMINGHAM · 20

LONDON, S.W.1
A. W. ZELLEY,
N. PAYNE,
R. W. HANKINSON,
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MIDLANDS
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EAST MIDLANDS
J. A. PEARCE,
HEAD OFFICE,

BRISTOL 4
W. L. WHITE,
CLOTHIER RD.

LEEDS, 14.
N. SHARPLES,
G. SUTTON,
WOODLANDS
FACTORY.

CHELTENHAM
C. GEARING,
P. ETHERIDGE
HIGH ST.

MANCHESTER, 3.
J. BALLENTINE,
J. H. RAMSAY,
B. J. WEBLIN,
WATKIN ST.

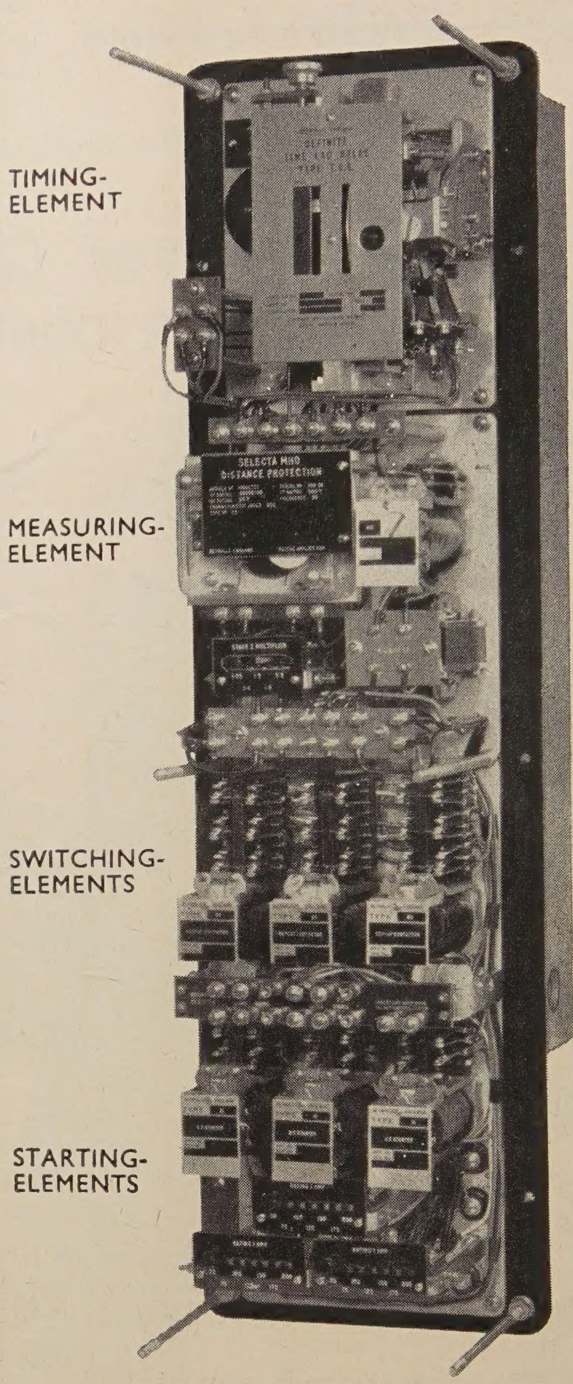
GLASGOW
J. D. HARRIS,
W. SPY,
SANDYFORD PLACE

BELFAST
R. A. SIMPSON,
DONEGALL ST.

REYROLLE

Selecta-mho

switched Distance Protection
based on the world-renowned
TYPE-H PROTECTION



Selecta-mho has been specially designed for those systems in which the utmost economy is essential.

Saves on first cost, which is less than half that of conventional systems.

Saves on installation and maintenance, because all equipment is static and only one measuring-element is used.

Saves on panel space, which is less than quarter of that of conventional systems.

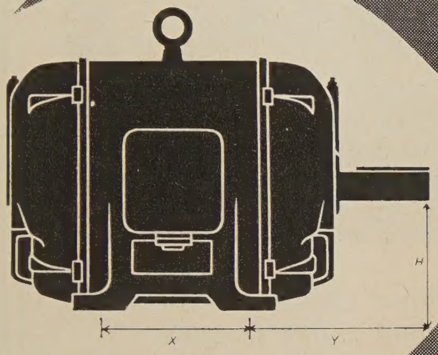
High standard of technical performance

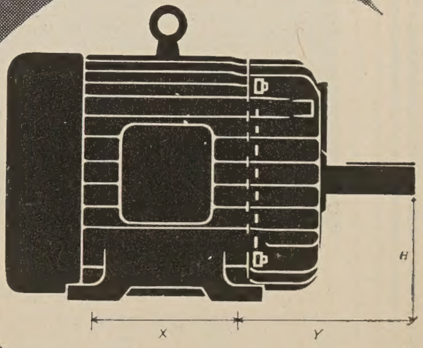
Short delivery

Reyrolle

A. REYROLLE & COMPANY LIMITED - HEBBURN - COUNTY DURHAM - ENGLAND

Dimensional Twins...





DRIP-PROOF type KN-C

TOTALLY-ENCLOSED FAN-COOLED type KN-D

AEI BRITISH STANDARD DIMENSION MOTORS

In stock—all standard ratings up to 40 h.p.
also all types of control gear

Please write for publication 3521-81 to:

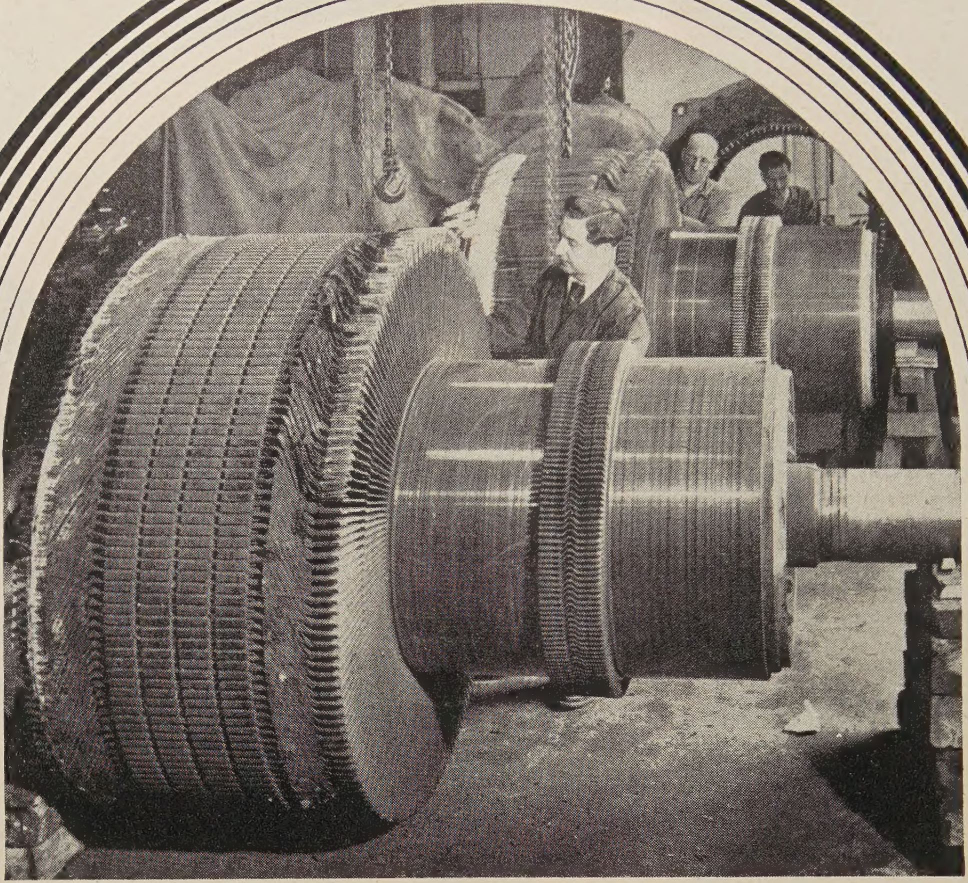
SMALL INDUSTRIAL MACHINES SALES, BLACKHEATH, STAFFS.

AEI

Motor & Control Gear Division

Associated Electrical Industries Limited

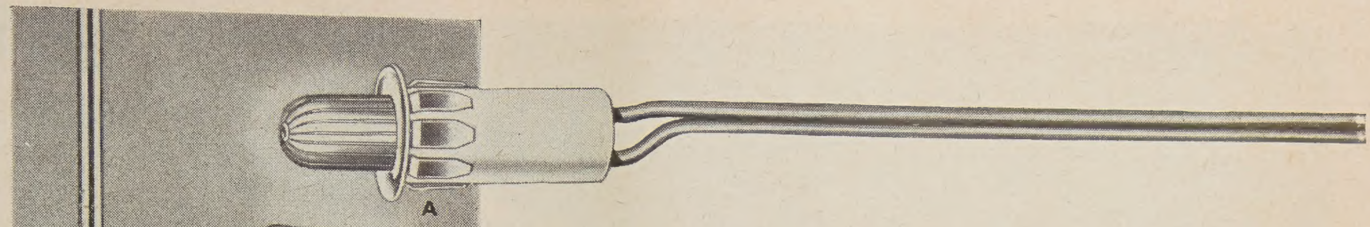
A5557

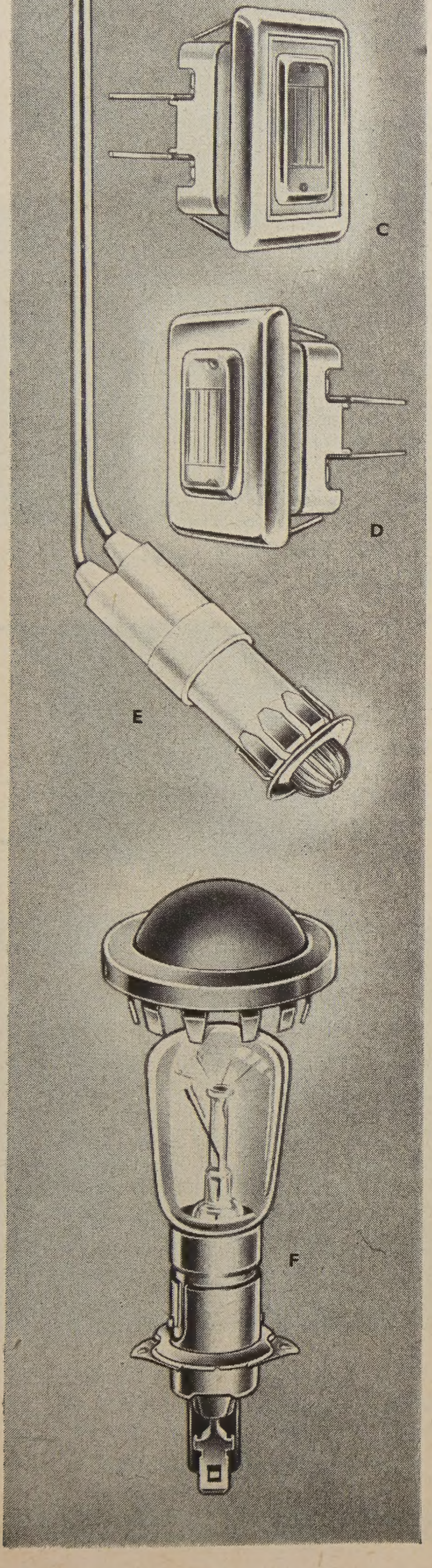


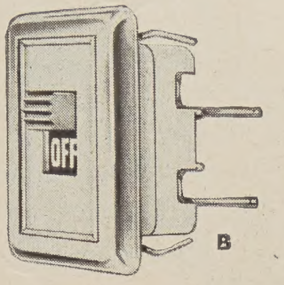
Engineers' Language! For every Plant Engineer who swears at Collins, there are ninety-eight and a quarter who swear by them. Engineers being engineers, this is quite something. As we were saying, we show two 1500kW 240-volt 600 r.p.m. D.C. Generators, one being stripped out for rewinding, t'other being rewound.

COLLINS

Collins Electrical Ltd.
Head Office 115 Clerkenwell Road London E C 1
Central London Works
22 St. Albans Place Upper Street Islington N 1
West London Works
9 & 11 Featherstone Road Southall
Phone Holborn 0212-4 Canonbury 3227-8
or Southall 0168







NEW SNAP-IN Neon Indicator Lights

AND ON-OFF SWITCHES

For indicator lights and switches that are easy to install and rattle-free (even under severe vibration), call in CARR.

Carr's Electrical Division produces a wide range of neon indicator lights and on-off switches, specially designed for speedy 'snap-in' assembly. Once installed, spring tension holds them firmly and securely.

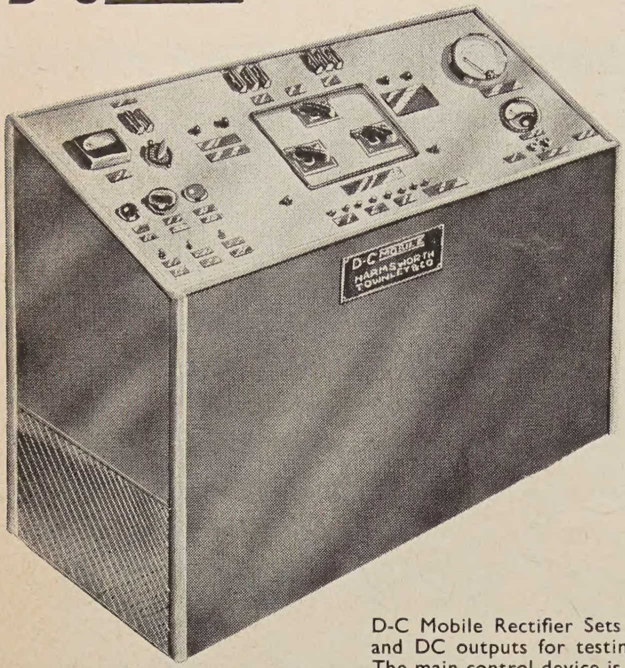
Special modifications to standard units can be made where large quantities are required: our engineers will be glad to assist and advise.

A Snap-in mains indicator light for panel thickness .032″—.093″.
B Snap-in mains on-off switch.
C Mains indicator light with Chrome Plated, half bezel.
D Mains indicator light with Chrome Plated, full bezel.
E Mains indicator light with plug and socket—splashproof design.
F Pigmy Signal light with domed lens and snap-in bezel.

CARR FASTENER COMPANY LIMITED
Stapleford, Nottingham Phone: Sandiacre 2661 Telex 37637
London: 195-197 Gt. Portland Street, London, W.1. Museum 9361.
Manchester: Sunlight House, Quay Street, Manchester, 3. Blackfriars 2533.
Birmingham: Silhill House, 2235 Coventry Road, Sheldon, Birmingham, 26. Sheldon 5208-9.
Glasgow: Baltic Chambers, Wellington Street, Glasgow, C.2. City 3202.

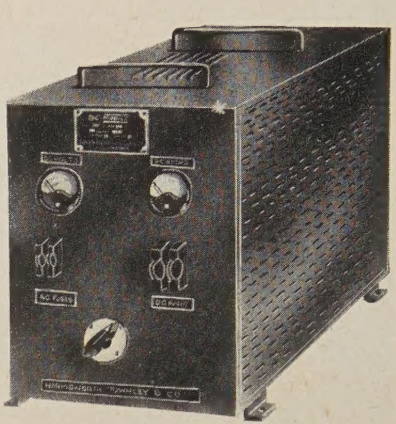
D-C MOBILE RECTIFIER SETS

30 W to 200 kW — 1 phase or 3 phase



Typical DC outputs

12 V	40 A
12 V	1,000 A
24 V	200 A
24 V	500 A
36 V	60 A
50 V	80 A
110 V	5 A
110 V	20 A
110 V	600 A
240 V	5 A
240 V	20 A
240 V	100 A



D-C Mobile Rectifier Sets from a large stock of "building bricks" for plating, anodising, DC motors, magnets and other applications. Outputs up to 1,000 V.

Large range of built-in control devices including Variacs, VOLTMOBILES, Saturable Reactors and G-Mobile Really Infinitely Variable Voltage Controllers.

D-C Mobile Rectifier Sets with multiple outputs. Illustration shows Console with AC and DC outputs for testing current coils of cut-outs, overload trips and H.R.C. fuses. The main control device is a built-in VOLTMOBILE.

VOLTMOBILE VOLTAGE SELECTOR AUTO-TRANSFORMERS

Output volts from 1·6% to 100% of supply volts in 64 steps.

ON-LOAD SWITCHING.

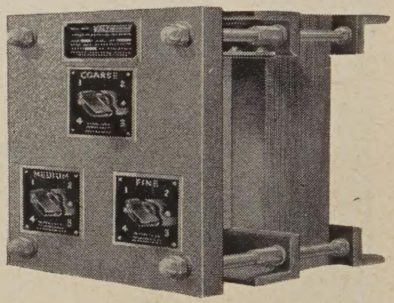
VOLTMOBILES can be used by themselves or in the primary of another transformer to give very fine changes of output.

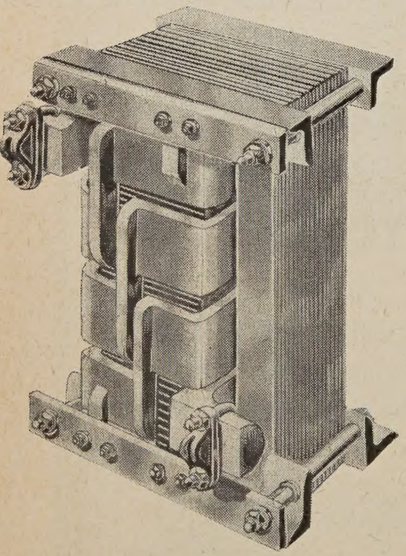
25% OVER-VOLTS AVAILABLE AS EXTRA.

Output 30A 60A 100A.

8 models.

For 1 phase and 3 phase standard supply.





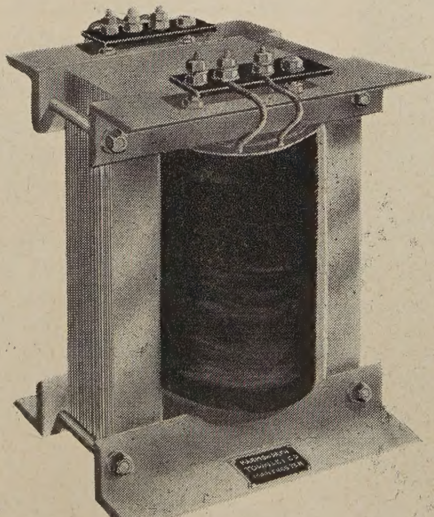
S-MOBILE HEAVY CURRENT TRANSFORMERS

For resistance heating, short-circuit testing, magnetising, bar heating

Typical Secondaries

2 V	2,000 A	10 V	700 A
4 V	6,000 A	10 V	1,000 A
5 V	500 A	20 V	3,000 A
8 V	3,500 A	20 V	4,000 A
8 V	150 A	50 V	600 A
10 V	300 A	110 V	400 A
10 V	500 A	110 V	500 A

Transformers can be supplied for 3 phase, 6 phase and 12 phase Rectifiers at short notice.



AMPMOBILE TRANSFORMERS

1 or 3 phase

Typical Secondaries

2 V	200 A	55 V	20 A
5 V	80 A	10-20-30 V	100 A
50 V	40 A	600 V	200 A

110 V centre tapped at currents up to 2,000 A. Isolating, low voltage and most other applications.

SPECIFIC ENQUIRIES are invited for Transformers, Saturable Reactors and Rectifier Sets.
We specialise in HEAVY CURRENT EQUIPMENT.

HARMSWORTH, TOWNLEY & CO. 4 Jordan Street Manchester 15

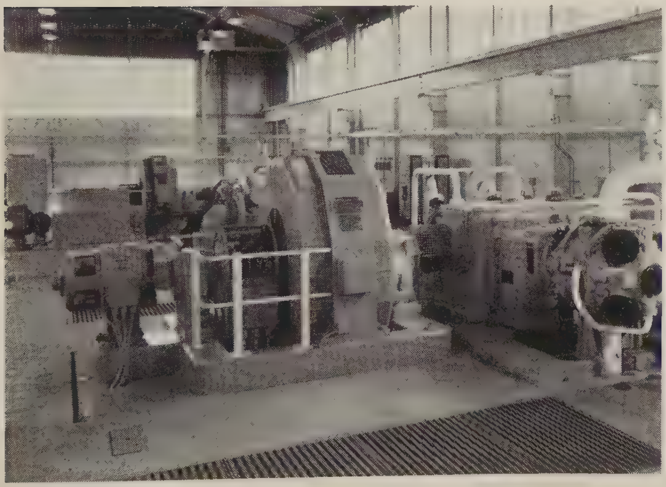
Telegrams WELDOFFIS MANCHESTER 15

Telephone CENTRAL 5069
CENTRAL 4281

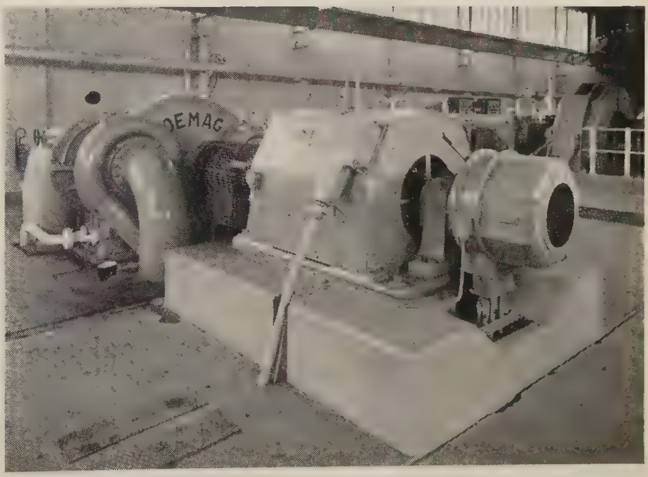
15,000 H.P. AT WESTFIELD

A group of closed-air-circuit weatherproof squirrel-cage induction motors driving carbonate pumps. Of 225 and 350 h.p. at 2950 r.p.m. these machines are direct-on-line started and operate at 3·3 kV.

Bruce Peebles manufactured the majority of the motors for the Scottish Gas Board's "Lurgi-type" high-pressure gasification plant at Westfield, Fife. Some 220 motors totalling over 15000 h.p. and of almost every type and enclosure were supplied, and amongst the unusually wide variety of motor applications are reciprocating compressors, various types of pumps, fans and boosters, and conveyors. Also supplied were induction generators for process energy recovery, and the control panels for the larger slipring and synchronous induction motors.



One of two 1450 h.p. 375 r.p.m. 3·3 kV screen-protected salient-pole synchronous induction motors driving reciprocating compressors.



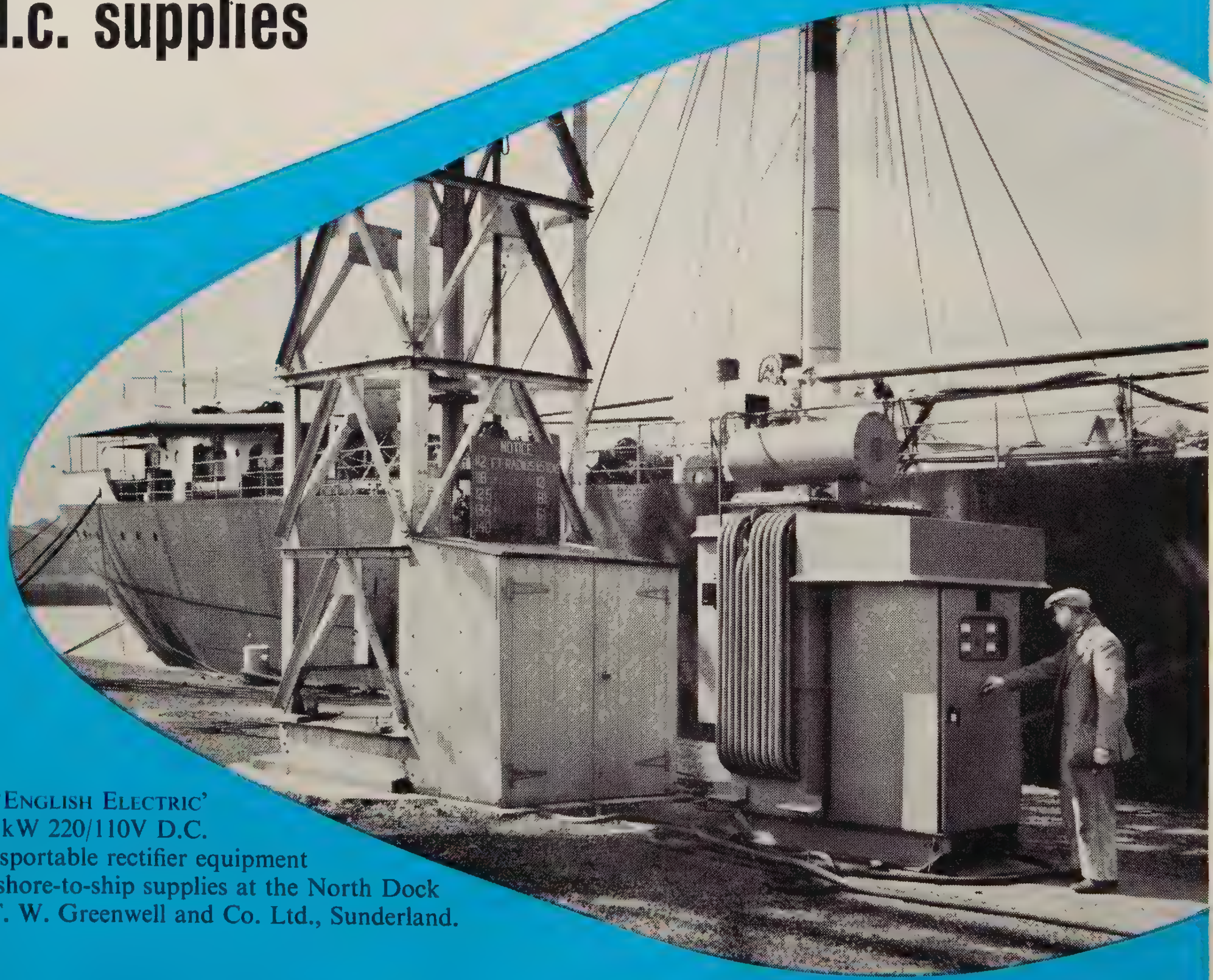
One of two 1800 h.p. 1480 r.p.m. 3·3 kV screen-protected slipring induction motors driving turbo-type compressors.

BRUCE PEEBLES & CO. LIMITED EDINBURGH

'ENGLISH ELECTRIC'

silicon rectifier equipments

for all industrial and dockyard d.c. supplies

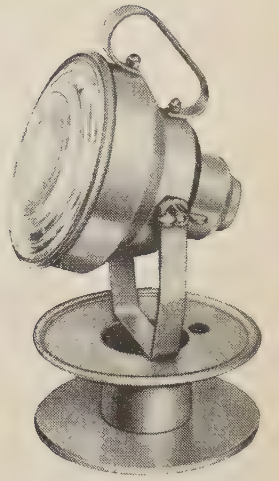


An 'English Electric' 220 kW 220/110V D.C. transportable rectifier equipment for shore-to-ship supplies at the North Dock of T. W. Greenwell and Co. Ltd., Sunderland.

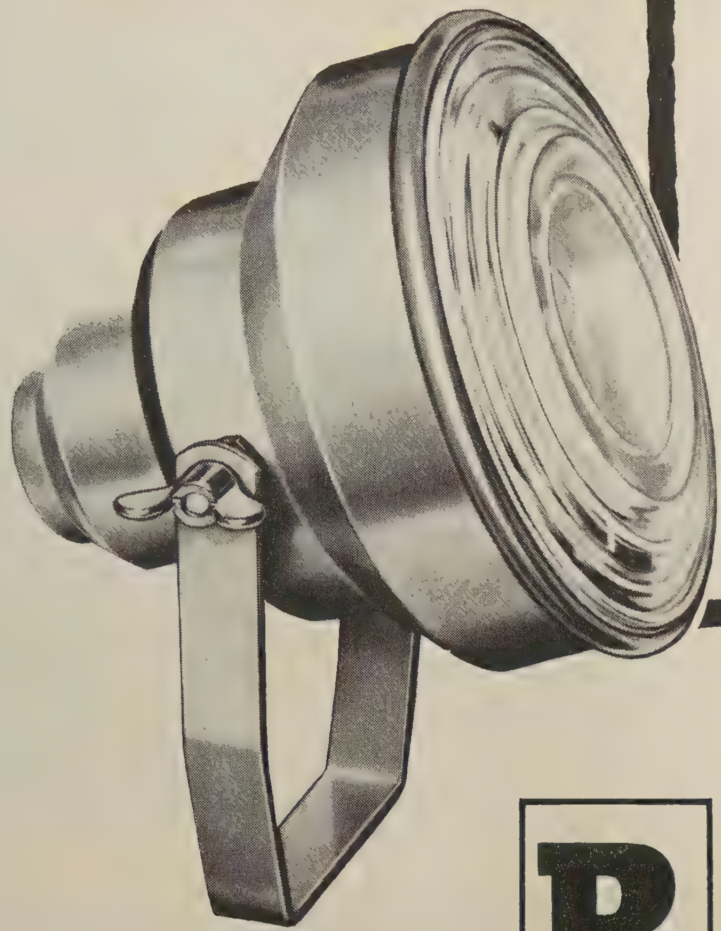
RECTIFIER SUBSTATION DEPARTMENT, STAFFORD

The English Electric Company Limited, English Electric House, Strand, London, W.C.2.

RS. 2



List No. 563
Transportable model with carrying handle and base in form of heavy steel drum for housing trailing cable.



R.E.A.L. IS A REGD. TRADE MARK

REAL

LOW VOLTAGE HEAVY DUTY FLOODLIGHT

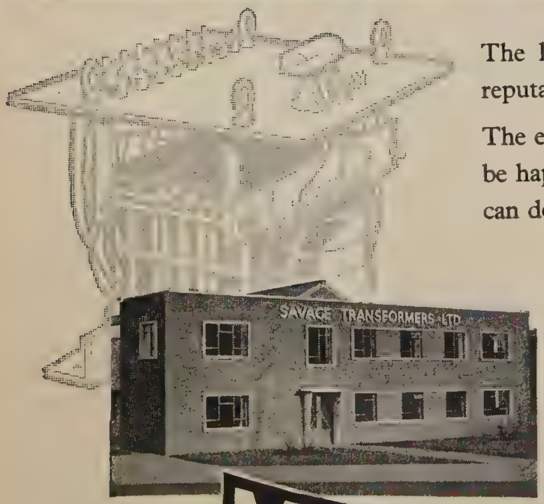
List No. 562

For — FIRE TENDERS, EXCAVATORS, CRANES, COMMERCIAL VEHICLES, & MARINE USE.

A truly heavy duty Lantern designed for use with 38 m.m. vehicle bulbs. This model incorporates a number of refinements on our original low voltage Floodlantern and can be supplied either with moulded heat resisting glass dome or with R.E.A.L. 'Supertuff' glass front.

Full details on request

ROWLANDS ELECTRICAL ACCESSORIES LTD; R.E.A.L. WORKS, BIRMINGHAM, 18



The little factory is a little nearer to being able to keep in step with its reputation!

The extra space is now available to cope with increased demand and we shall be happy to show new friends as well as old, what goodwill and co-operation can do to make business relations as friendly as they should be.

If you have a control problem, however complicated or simple, write to

THE LITTLE FACTORY WITH THE BIG REPUTATION

MASSICORE SAVAGE

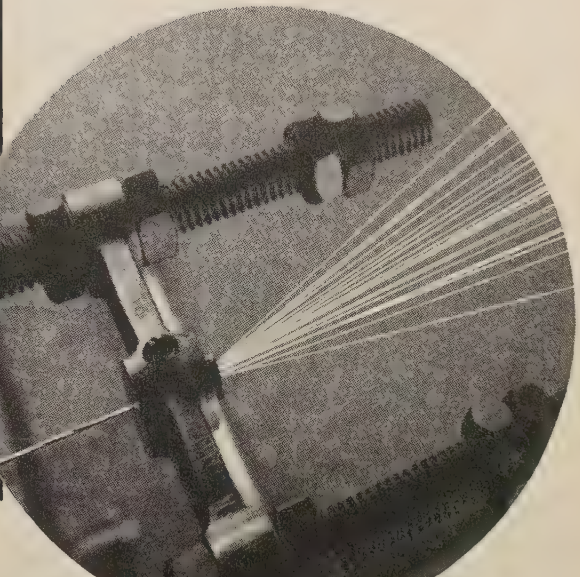
SAVAGE TRANSFORMERS LIMITED
NURSTEED ROAD, DEVIZES, WILTS
Tel: Devizes 932

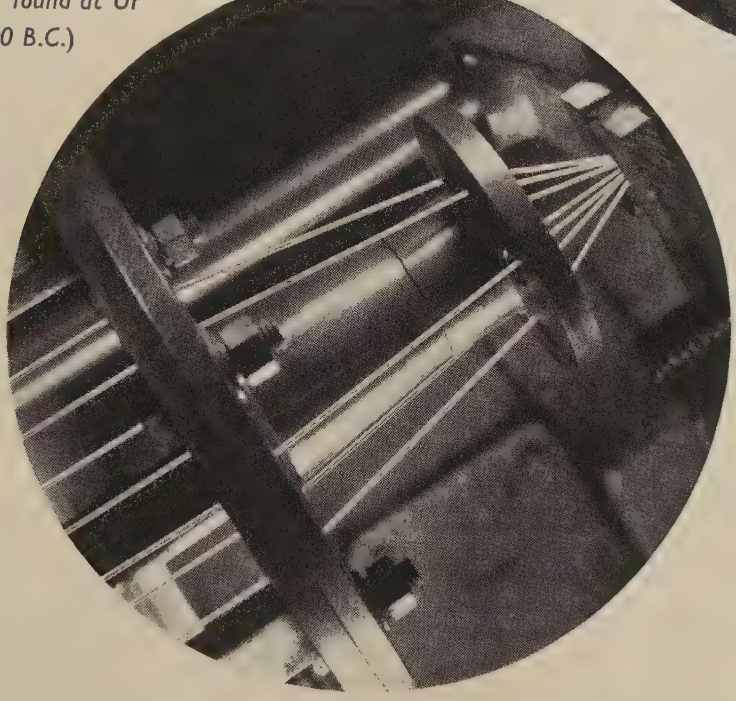
ST. 103

FROM UR*
TO ANACOS

. . . . copper plays its part in almost every phase of man's activities.

** Cast Copper bull's head found at Ur (2700 B.C.)*





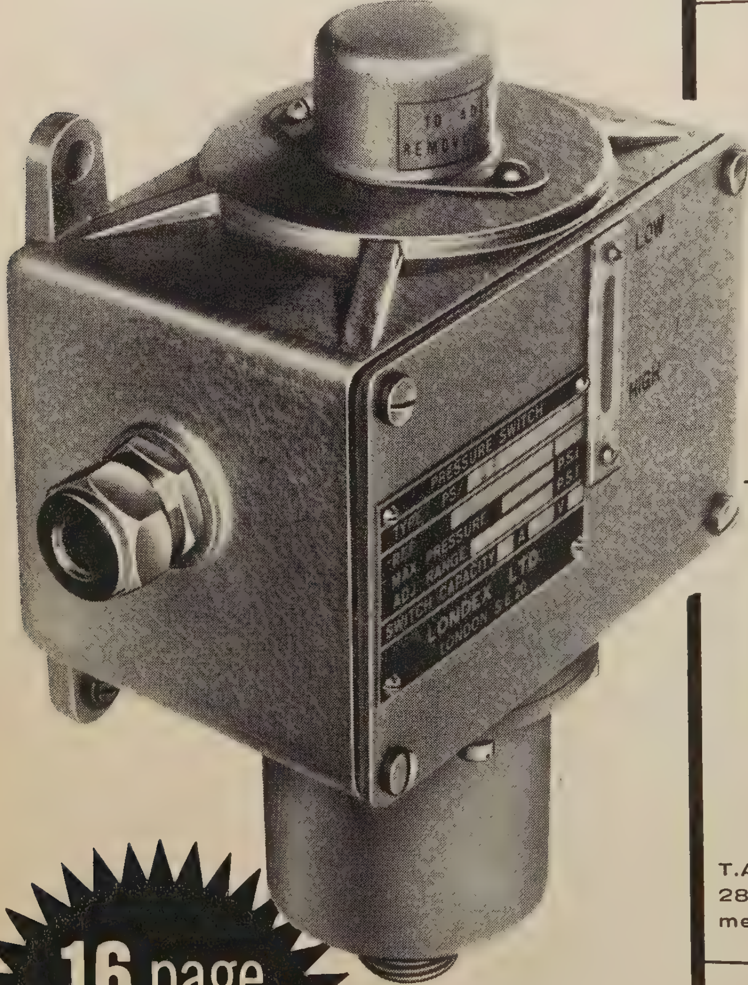
STRAND

Copper wire is passed through the machines to form stranded conductors of 3, 7, 19 or 37 wire constructions, hard drawn for overhead lines, railway feeders, aerials and annealed for cable making, earthing conductors and similar applications.
Modern machinery and skilled workmanship ensure that ANACOS Copper Strand continues to maintain its established high standards.

ANACOS COPPER

FREDERICK SMITH & COMPANY · ANACONDA WORKS · SALFORD 3 · LANCS

PRESSURE
SWITCHES
AND VACUUM SWITCHES
in 100's of variations



16 page booklet FREE

robustly
built
for all
industrial
uses

LONDEX LTD

ANERLEY WORKS
LONDON, S.E.20
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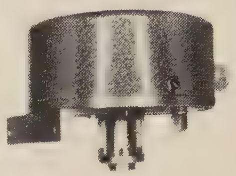
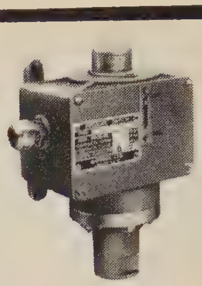
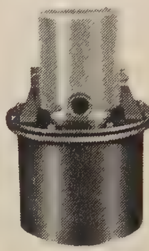


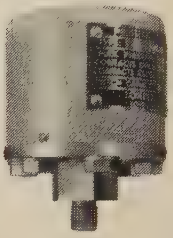
Type PS/A
T.A.R. ·5 to 3·5 ins. w.g.



Type PS/P
T.A.R. from 50 to 5000 p.s.i.



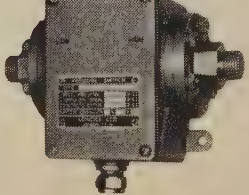
Type PS/WG
T.A.R. from 2 to 20 ins. w.g.



Type PS/M
T.A.R. from 10 to 350 p.s.i.

Type VS/C
T.A.R. from 2 to 28 ins. vacuum mercury gauge.

Type PS/MIN
T.A.R. from 10 to 180 p.s.i.



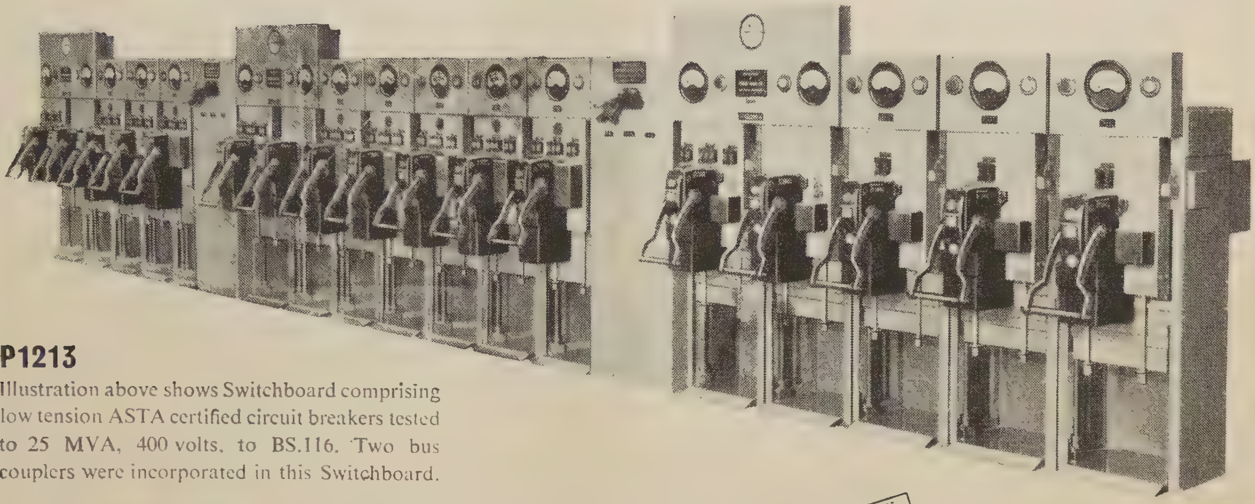
Comparative differential Switches to cover all ranges.

Double pressure Switches for all ranges.

T.A.R. Typical adjustable ranges

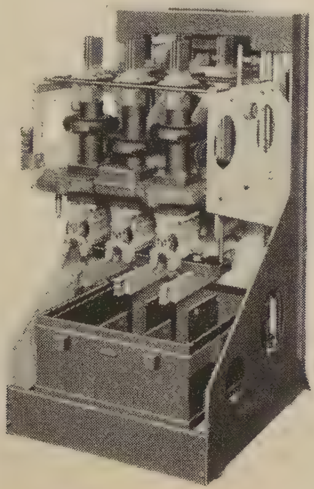
FOR HEAVY DUTY

THE MB RANGE OF CIRCUIT BREAKERS ILLUSTRATED BELOW HAS BEEN SHORT CIRCUIT TESTED AT AN ASTA STATION, THE LOW TENSION RANGE HAVING A CERTIFICATE FOR 25MVA, 400 VOLTS. THE 3·3 KV RANGE 75 MVA, ALL TO BS. 116.

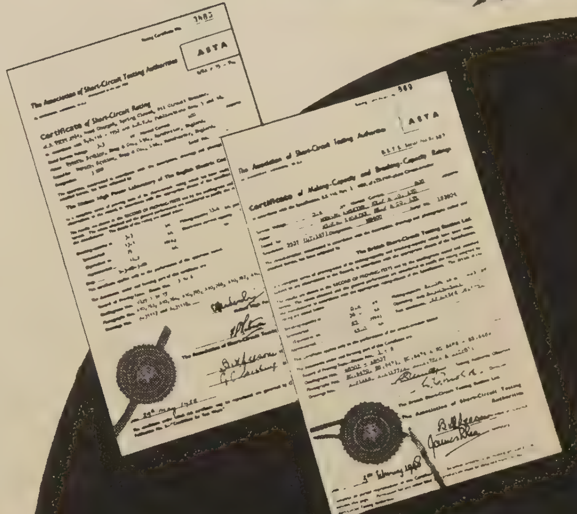


P1213

Illustration above shows Switchboard comprising low tension ASTA certified circuit breakers tested to 25 MVA, 400 volts, to BS.116. Two bus couplers were incorporated in this Switchboard.



P1245 The circuit breaker unit illustrated at the left is one of our 1600 amp. units of the same range as illustrated in the Switchboard above. It is of modern robust construction and suitable for controlling a 1000 kVA transformer. Our 1600 ampere unit has now been successfully tested at 31 M.V.A. 400 volts, to BS. 116.



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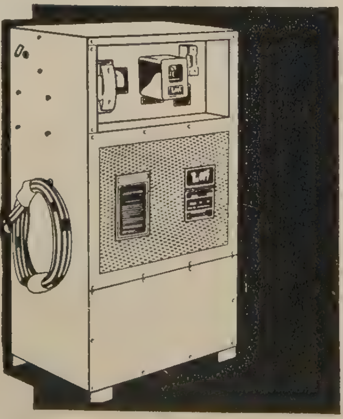

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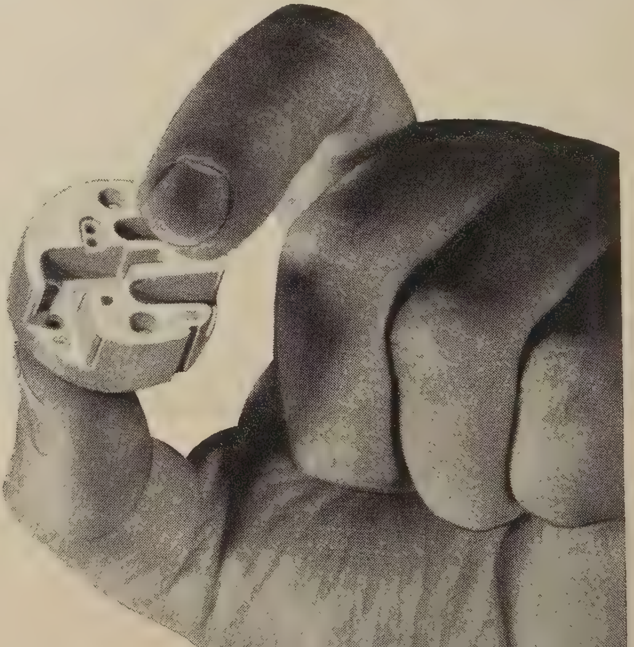

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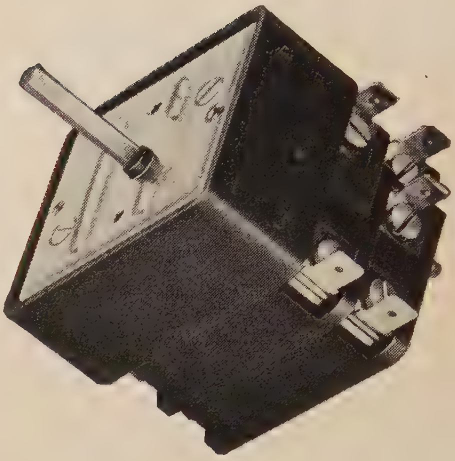

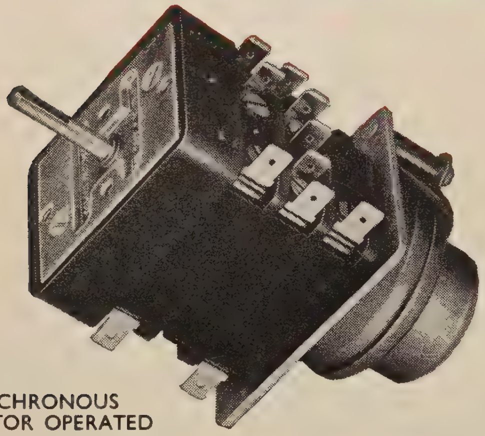

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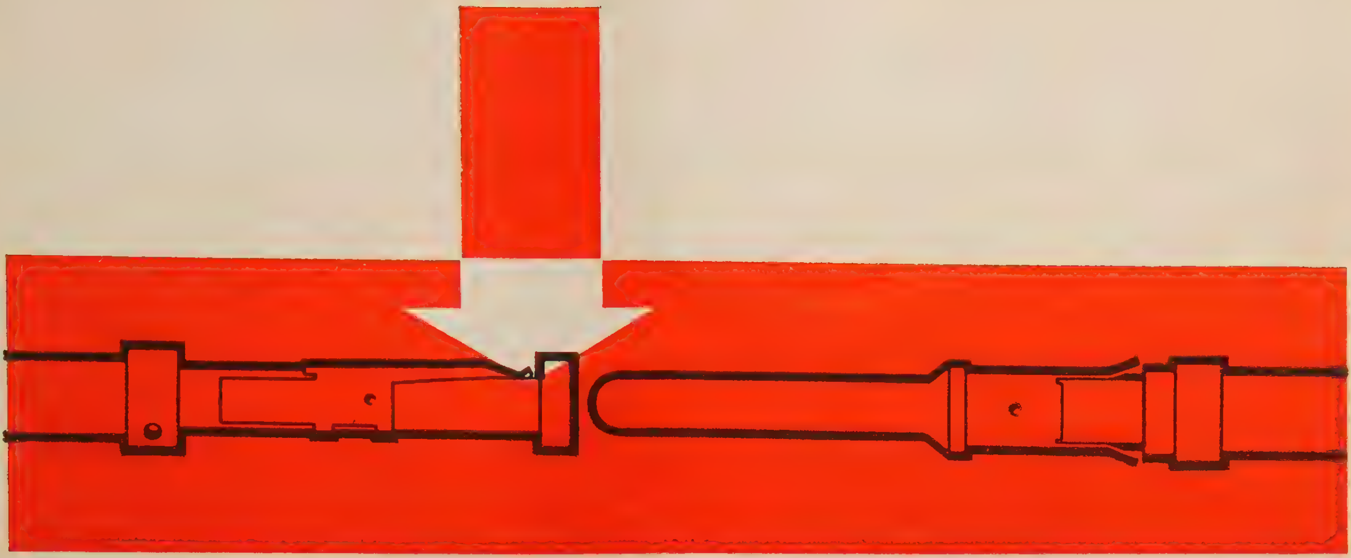

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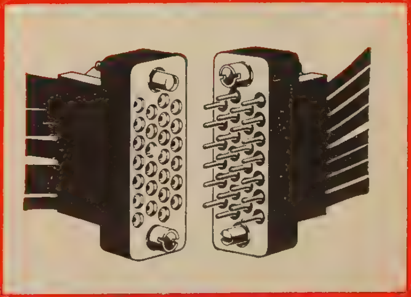

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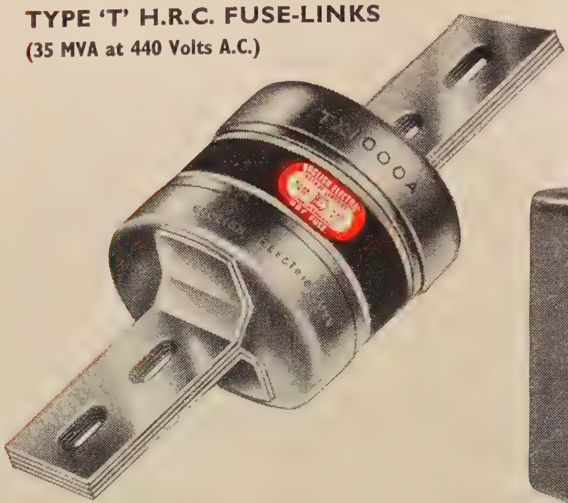

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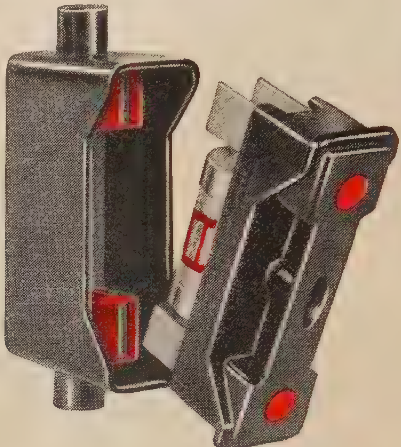

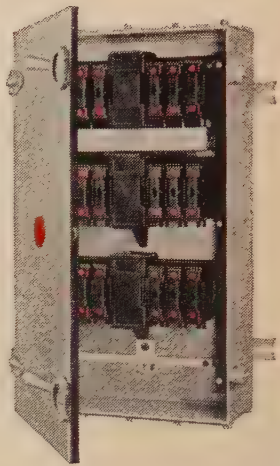

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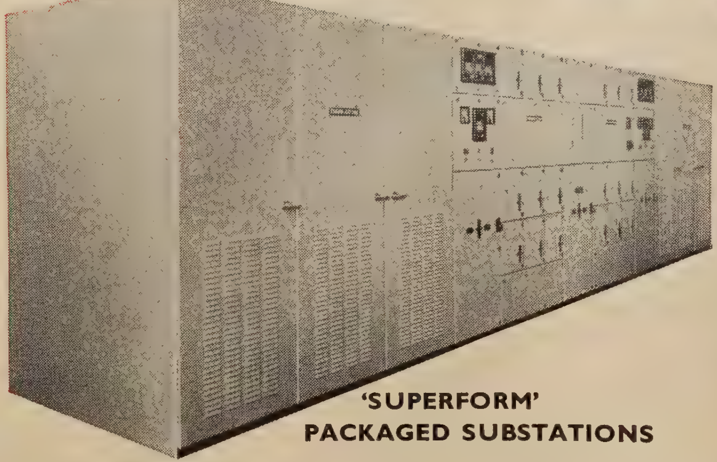

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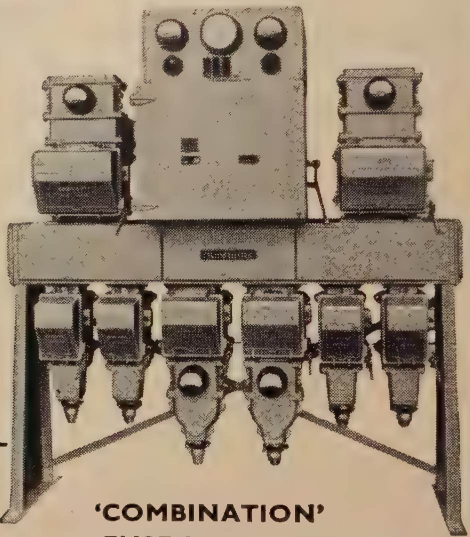

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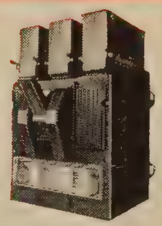

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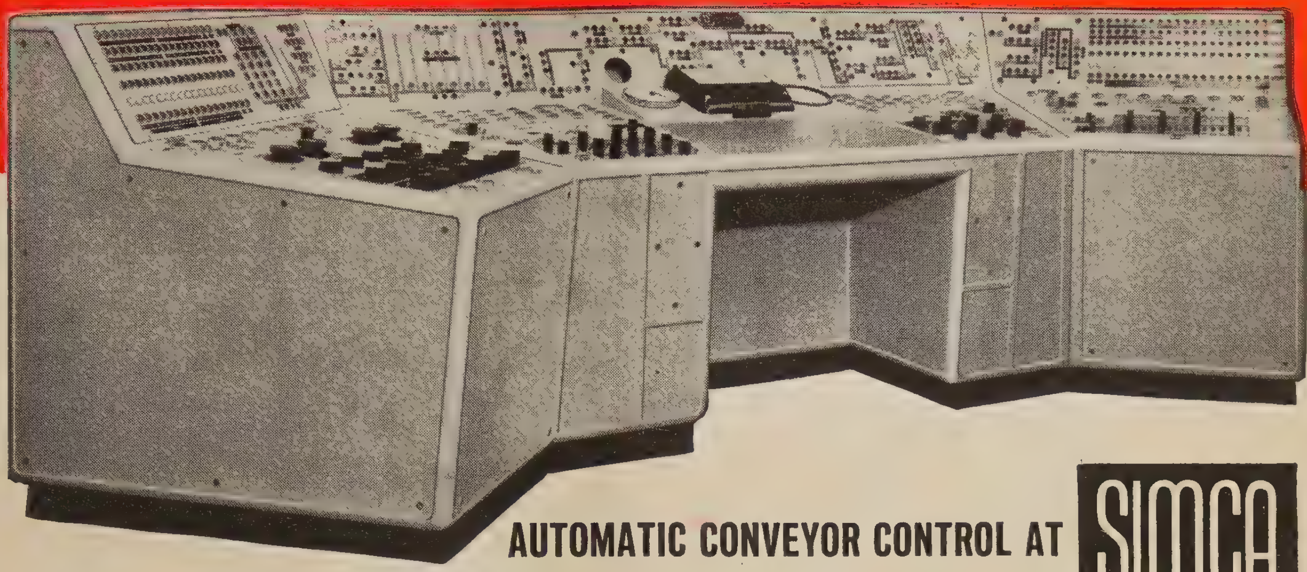

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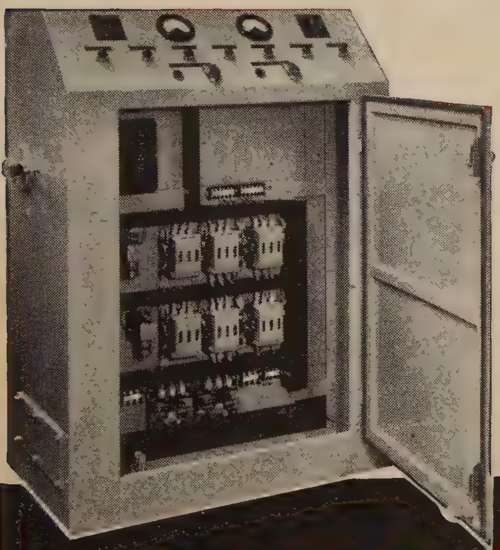

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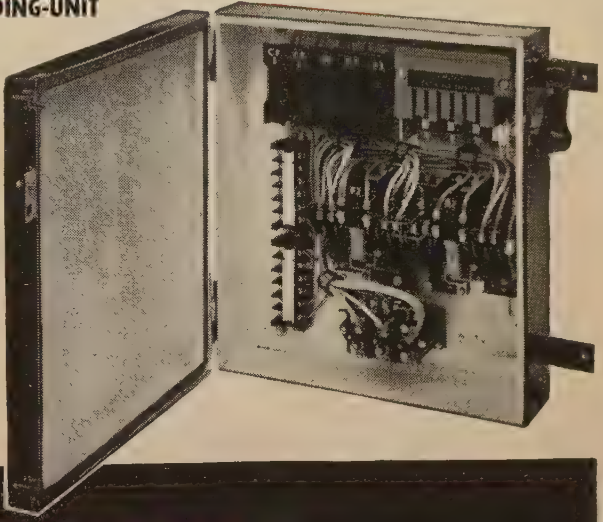

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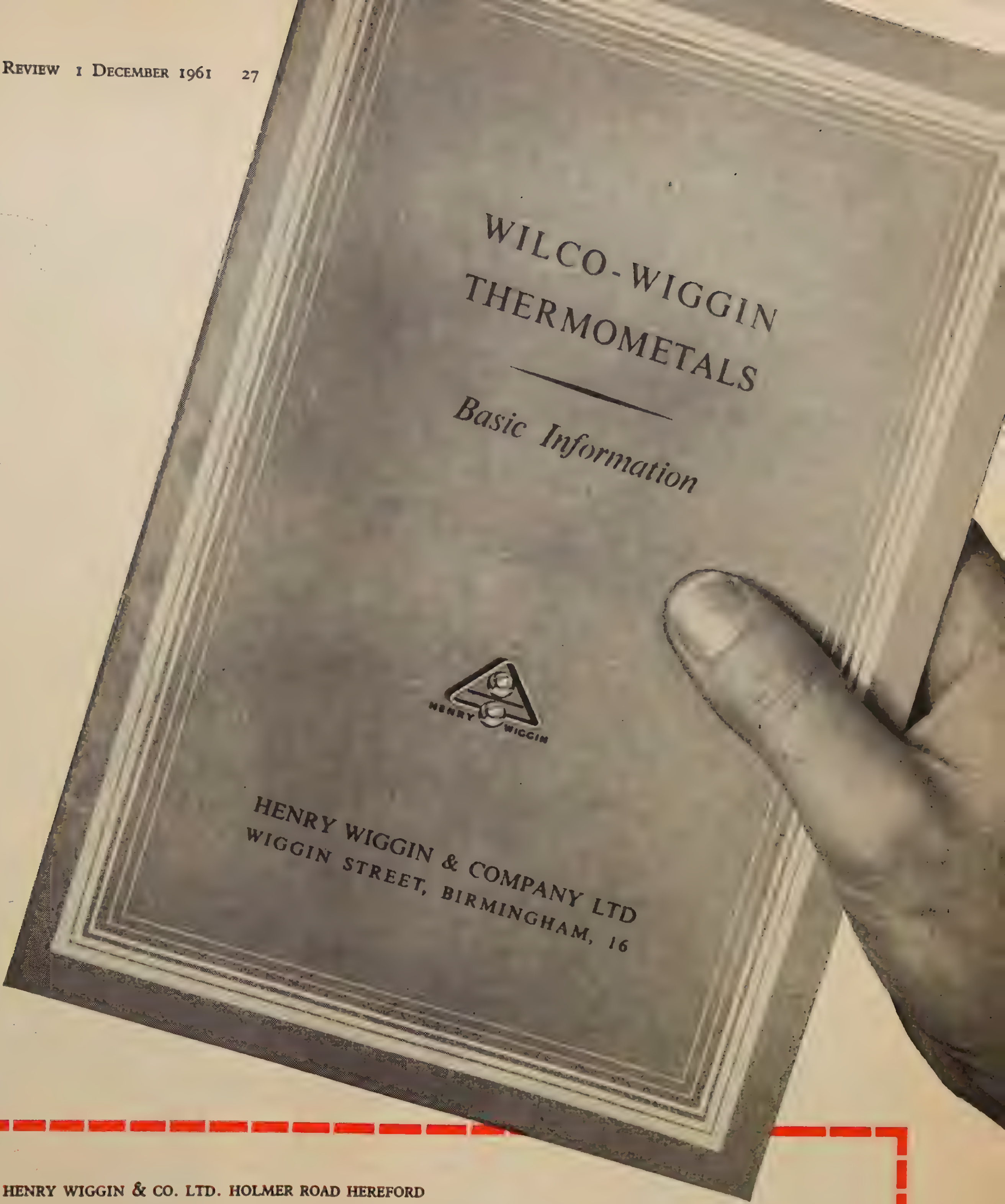

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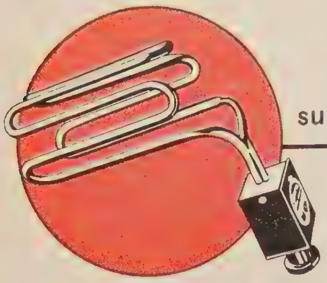

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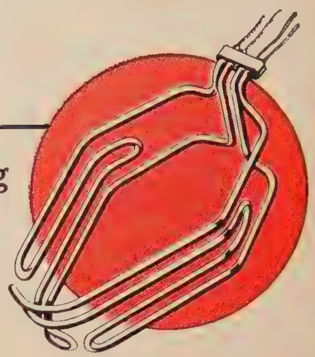

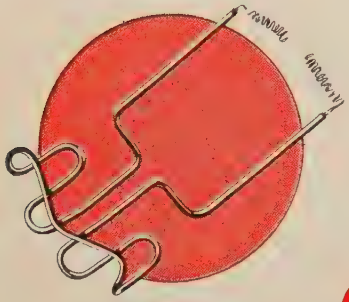

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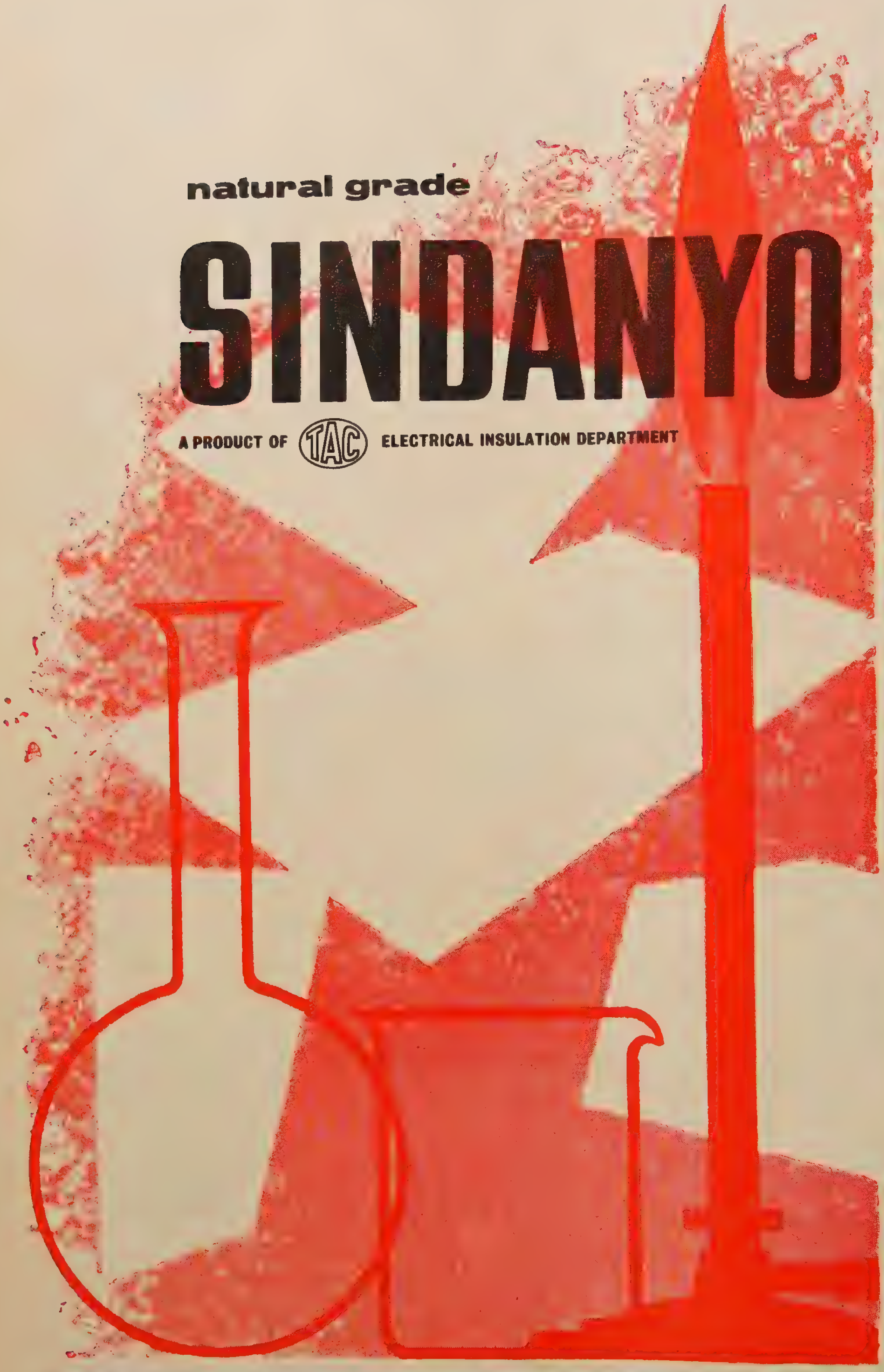

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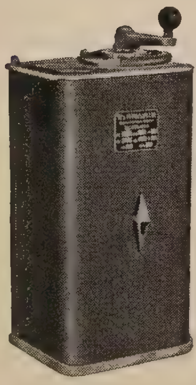

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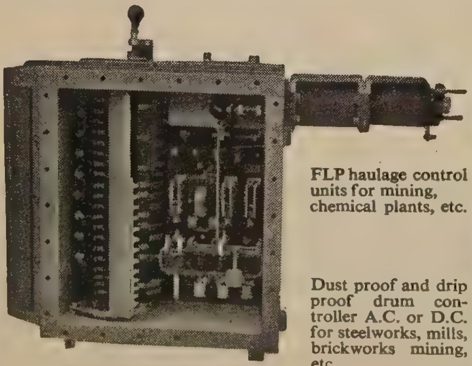

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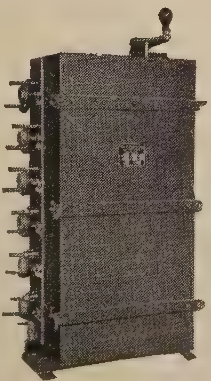

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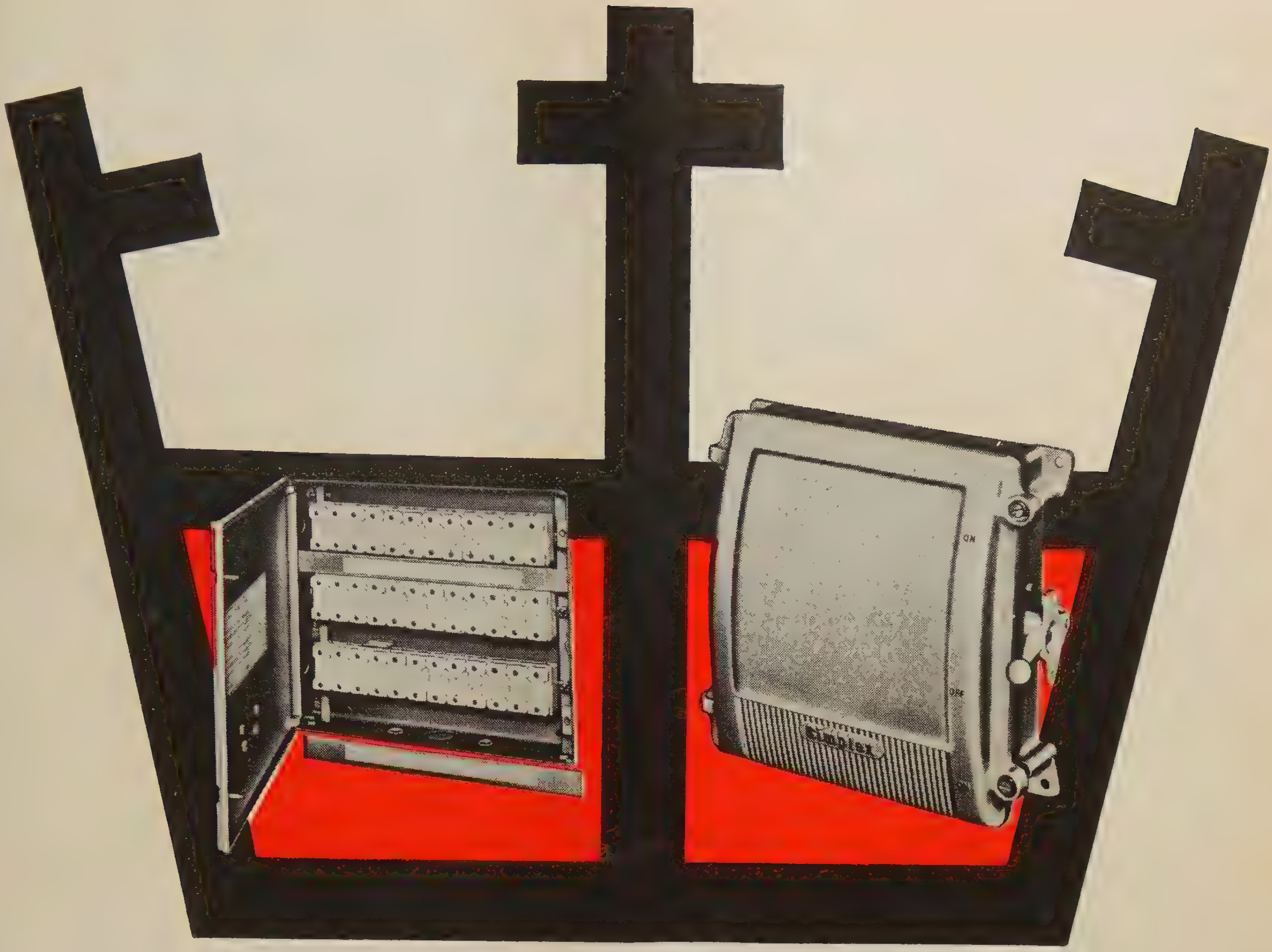

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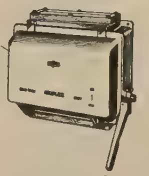

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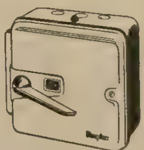

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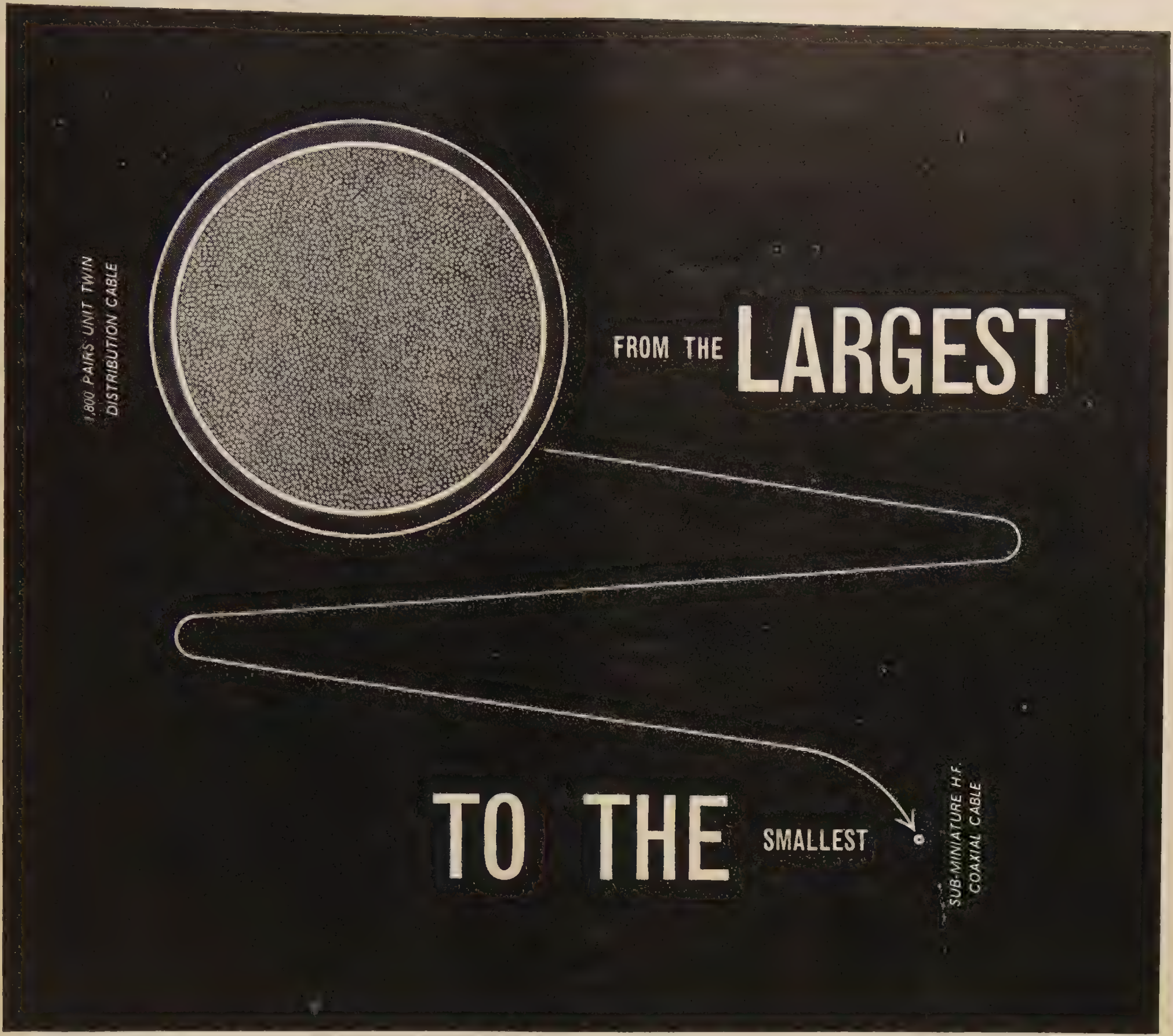
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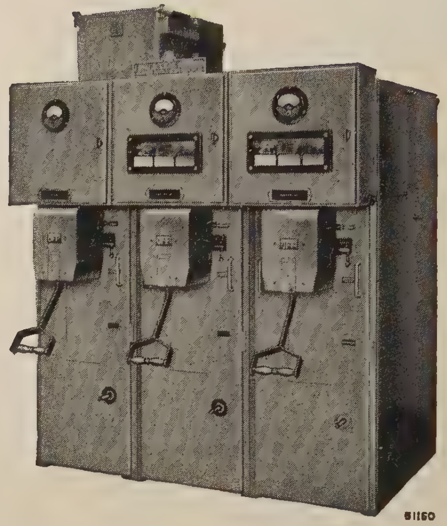

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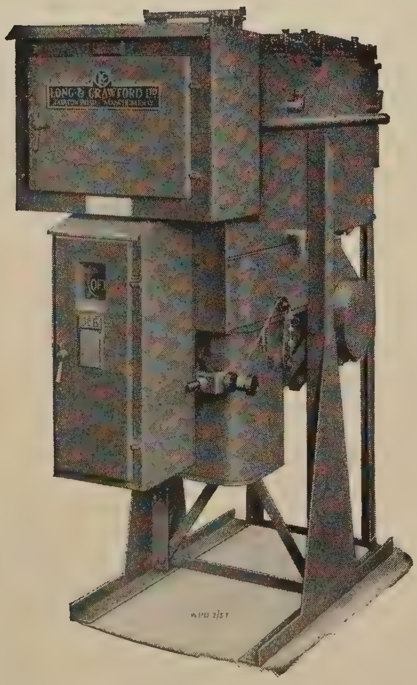

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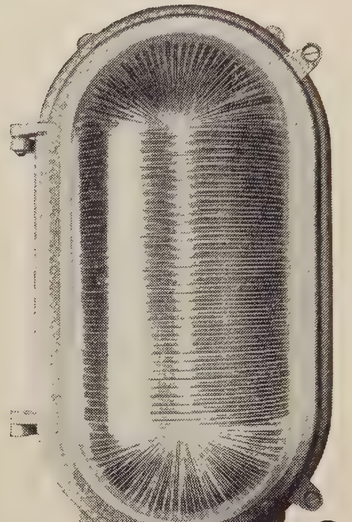

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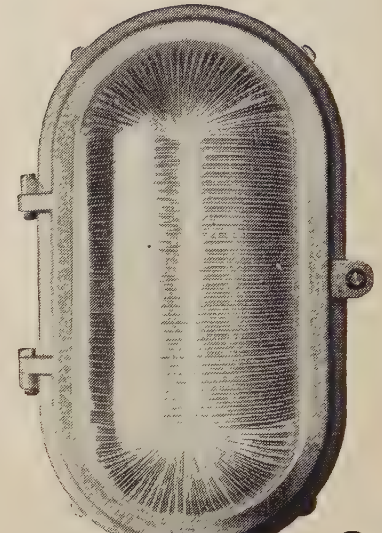

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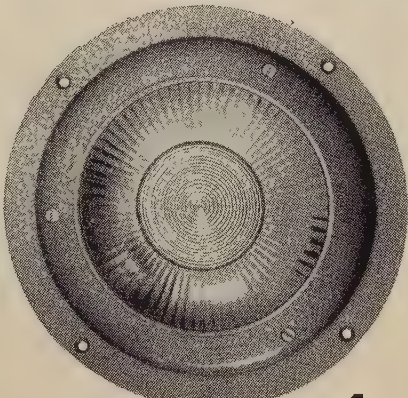

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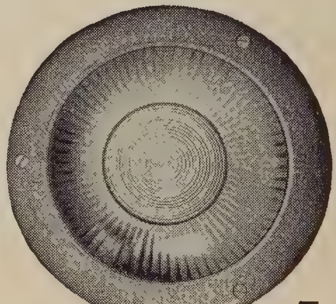

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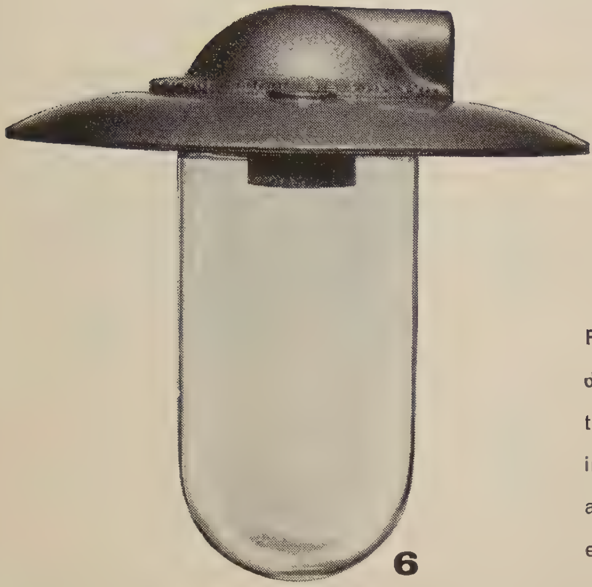
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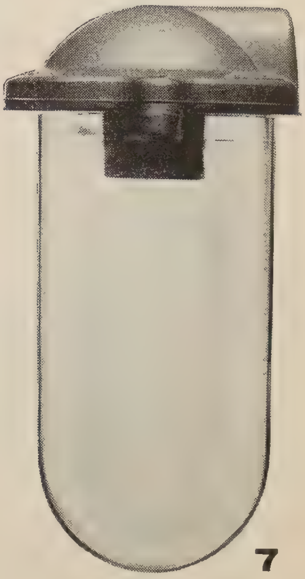
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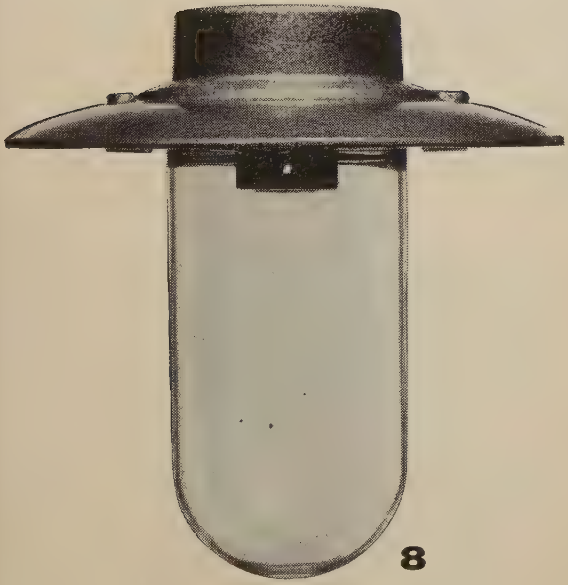
Four standard fittings (Nos. 6, 7, 8 and 9) are illustrated on this page and each is available in either Die-cast aluminium alloy or cast iron, Stove enamel hammered grey finish or galvanised cast iron. Clear wellglass is mounted on a rubber seating washer and is located by two fixing lugs designed to allow removal of glass without detaching screws. 40, 60 or 100 watt tungsten lamps are suitable for these fittings. Wire guards and matching backplates and brackets are available if required. For full details refer to our leaflet which is obtainable from the address below.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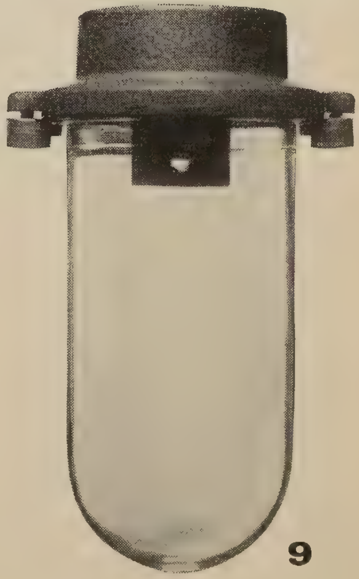
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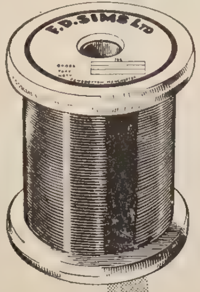

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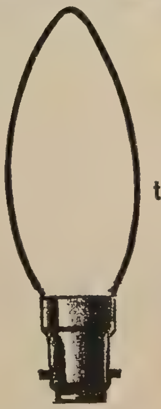

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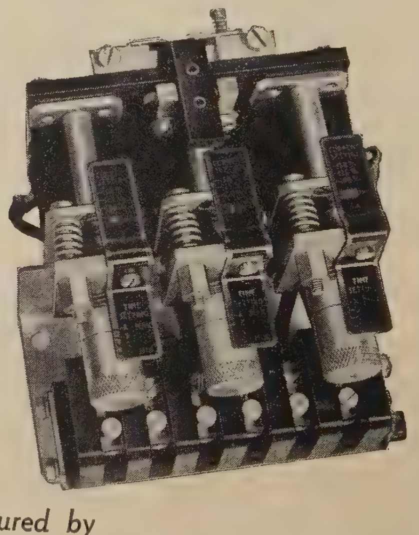

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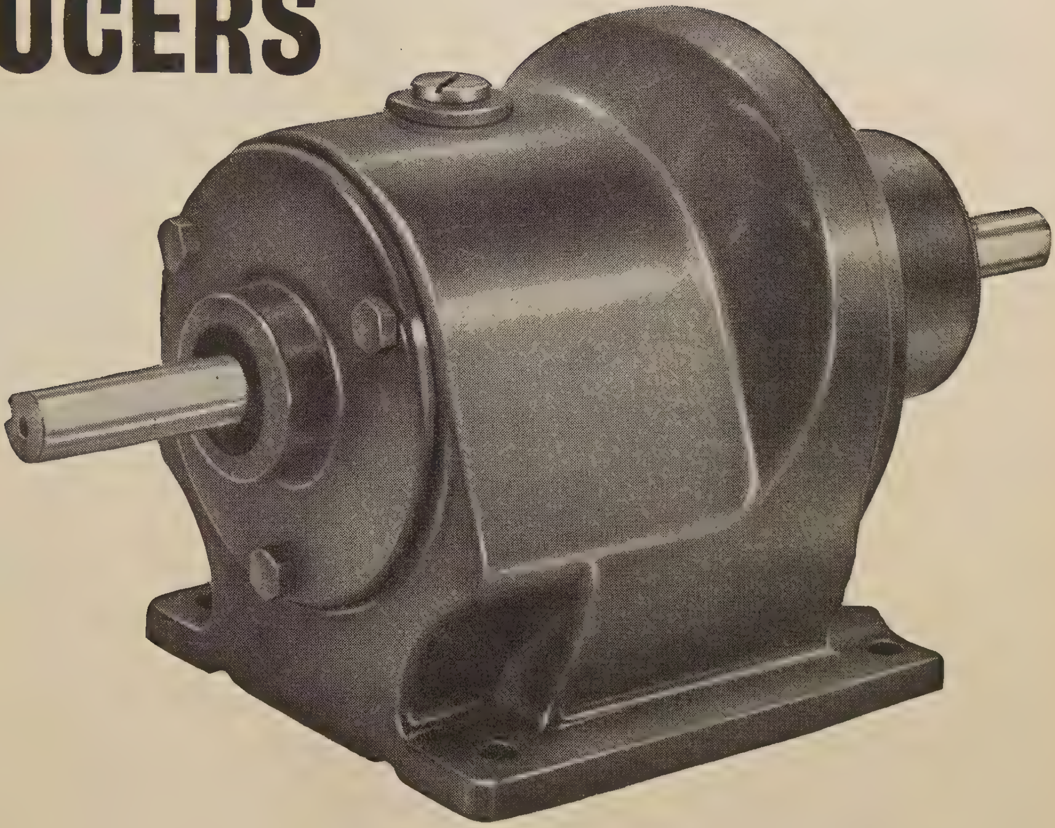

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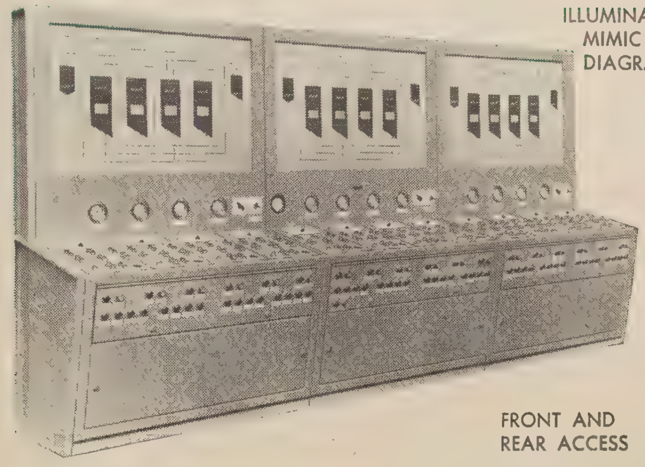

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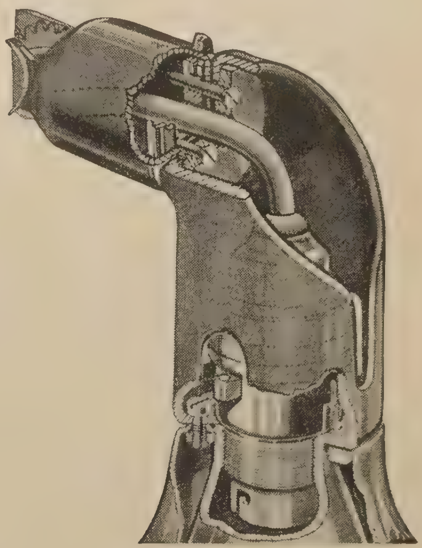

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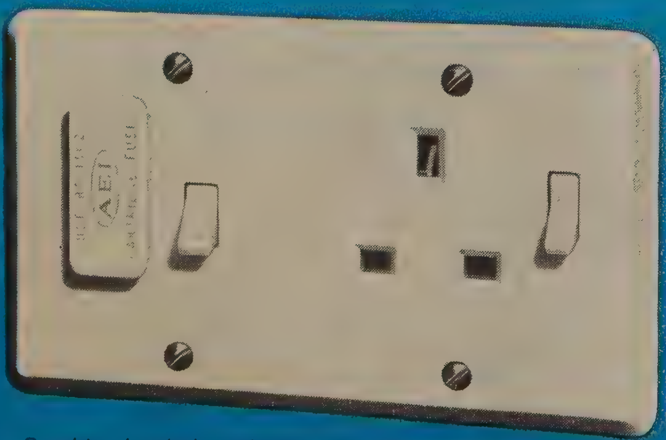

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Managing Director H. S. Pocock, M.I.E.E.
Dorset House Stamford Street London SE1
Telephone Waterloo 3333
Telegrams Elecrev, London, Telex
Cables Elecrev, London, SE1 · *Code* ABC

Please address correspondence to **Editor, Advertisement Manager, or Publisher,** as appropriate. Published weekly (Fridays). Registered at the General Post Office as a Newspaper. Entered as Second Class Matter at the New York, U.S.A., Post Office. Price: 1s 6d per copy. Annual Subscription: Home £4 0s 0d; Overseas £5 15s 0d; U.S.A. and Canada $16.00. Remittances payable to " Electrical Review."

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ELECTRICAL REVIEW

Friday 1 December 1961 Volume 169 No 22

IN THIS ISSUE

867 Railway Modernisation
The state of railway finances makes it unlikely that new schemes will be undertaken at present, but the traffic increase which invariably follows the introduction of electric traction will ensure it a growing place in the " streamlined " system of the future

869 Transformer Oil Treatment
A mobile oil processing unit is described by the author, Mr. F. Hughes, who gives details of its use during initial transformer filling and in transformer drying operations

873 Measurement in Electricity Supply
In this article Mr. L. B. S. Golds discusses the position of metering in an electricity supply organisation and the status of those concerned with this work

875 Loch Awe Project
Progress of work on the North of Scotland Hydro-Electric Board's £24·5 million scheme

876 Power System Analysis
In an I.E.E. Supply Section paper presented last week Dr. A. S. Aldred discussed electronic analogue computer simulation of multi-machine power system networks. A second paper, by Mr. J. G. Miles, was concerned with the overall stability of such systems

879 Industry and the House
In this week's commentary Mr. Austen Albu, M.P., deals with the Government's reaction to the recent announcement of an increase in wages in the electricity supply industry

897 United Kingdom Electrical Trade
In October electrical exports amounted to £21·6 million and the total so far this year is now £215·2 million against £188·5 million in the corresponding period of 1960

NEWS SECTIONS

881 Views on the News
882 Electricity in Factories
883 Electrical Power Engineers
884 Letters to the Editor
885 Personal and Social
888 Industrial News
894 New Electrical Equipment
899 Next Week's Events
900 Financial Section
904 Contract Information
77 *CLASSIFIED ADVERTISEMENTS*
88 *INDEX TO ADVERTISERS*

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ELECTRICAL REVIEW

1 December 1961 Vol. 169 No. 22 Established 1872

Railway Modernisation

IN deciding the appropriate allocation of available resources of labour and materials between immediate and future needs, British Railways are more favourably placed than most major industries. Diesel prime movers were introduced as a short-term measure of improvement and are providing the expected satisfactorily improved service whilst allowing ample time for the evolution of the ultimate aim of general full-scale high-voltage electrification at industrial frequency based upon the national grid. This development, now in its initial stages, will necessitate elaborate treatment, but the time absorbed in bringing it to fruition will be well spent in taking advantage of the rapid technological progress arising out of researches now being actively pursued and of experience gained in operation.

In particulars given at the Brazilian Federal Railways Conference recently, Mr. J. A. Broughall (assistant chief electrical engineer, British Transport Commission) was well able, from results up to August of this year, to substantiate the earlier claim of Sir Brian (now Lord) Robertson, that certain setbacks which have been widely publicised have affected only a very small part of the equipment that has gone into service. Such troubles have masked the real success already achieved, taking into account the original character of some of the details of requirements, and that the first orders were placed with manufacturers only about five years ago.

In his annual report on railway accidents, published last month, Brig. C. A. Langley refers to the failures of the multiple-unit stock both in the Glasgow area and the Eastern Region operating from Liverpool St. Detailed inquiries have brought to light the major sources of trouble and the amendments necessary to restore services. These have nearly been completed, and when, as the result of further investigation, problems of voltage change-over, the operation of the air-blast circuit-breakers, and pantograph "bounce" are solved, there seems no doubt that the British system of operating multiple-unit trains on a dual high voltage a.c. supply will prove thoroughly efficient, safe and reliable.

The present position of the railways may be likened to that of the electricity supply industry in its early days when dependence was mainly on isolated steam plants, before internal-combustion engines were built for larger outputs, a system which developed into generation by high-efficiency turbo-generators served by boilers burning slack coal. Railway modernisation, however, has other aspects than that of fuel economy, such as reduction in maintenance costs, modernisation of marshalling yards and other matters.

Transport is somewhat analogous to friction in mechanical engineering in that it forms an unwanted but inevitable addition to the costs of production and distribution. The savings confidently expected through railway modernisation will be substantial. Moreover, as Mr. S. F. Steward, director of the British Electrical & Allied Manufacturers' Association, emphasised in his article in our issue of 27th October, the success of this country's export trade in the electric traction field depends absolutely on the continuity and success of British Railways' electrification plans.

ELECTRIFICATION PROSPECTS

These plans have, of course, been in doubt on certain previous occasions as that part of the electrical industry concerned with supplying electrification equipment well knows. The present unfortunate state of railway finances, as revealed by Mr. Marples in moving the second reading of the Transport Bill in the House of Commons last week, makes it seem doubtful if many new schemes will be undertaken for some time to come. It seems most unlikely, however, that present electrification plans which have had to be nurtured so carefully by the electrical industry, as well as by the railways themselves, will now be changed. This particularly applies to the Crewe-Euston project. The Bill is primarily concerned with administrative changes, but it makes provision for considerable reductions in the size of the railway system. Only when these have been announced is it likely that future electrification schemes will be considered. The traffic increase engendered by electric traction, a fact fully appreciated by those concerned with railway operation, will ensure it a steadily growing place in the " streamlined " railway system of the future.

TOO FAST ?

In the 1961 Mitchell Memorial Lecture, summarised in last week's issue, Sir Christopher Hinton said that the downward trend in the capital cost of civil nuclear stations of the magnox type was due to the growing familiarity of the nuclear power industry with the problems of plant design and construction. But the " rapid rate of growth [137·5 MW per reactor at Berkeley to 290 MW per reactor at Sizewell] is not achieved without risk of failure; the only reactors of which there is operating experience are those at Calder Hall and Chapelcross with capacities of 40 MW. It is a rate of extrapolation of experience far greater than is welcome to responsible engineers." But, said Sir Christopher, this rate of technological advance had been forced on us in an effort to bring the cost of nuclear power down.

The nuclear power programme was initiated because it was thought that coal and oil supplies would soon become inadequate. This problem is now seen to be not so immediately serious as was forecast, so that if Sir Christopher's words are to be taken literally the contracts for Sizewell, and perhaps Dungeness, might have been postponed for two or three years until Berkeley and Bradwell had been proved. By that time, it might also have been possible to go for the more economical A.G.R. station.

ELECTRIC HEATING " SYSTEMS "

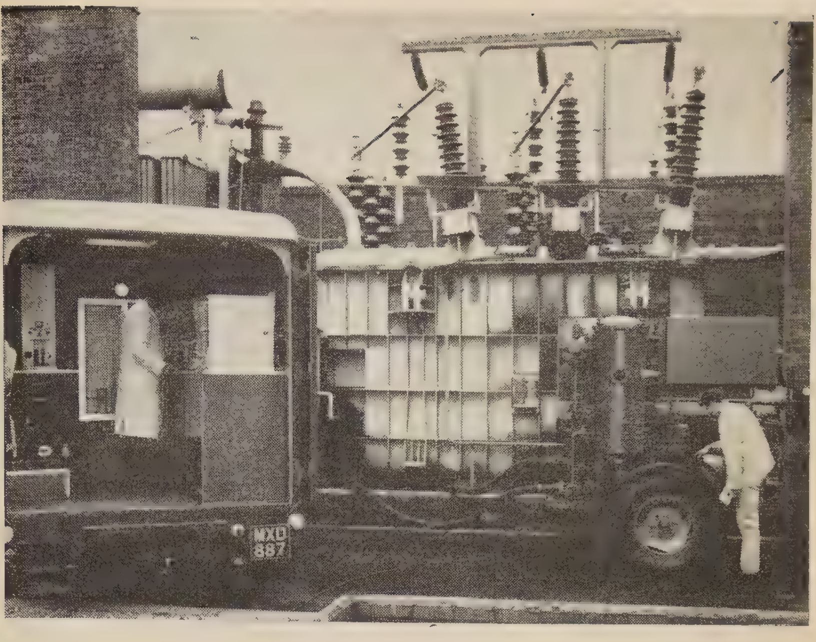
Domestic heating, in its various forms, is now receiving a great deal of attention. It is notorious that electricity's competitors are not too scrupulous in their cost comparisons and they are being aided by high-pressure salesmen who are endeavouring to foist spurious electric heating "systems" upon householders. *Shopper's Guide* (sponsored by the British Standards Institution) takes up this subject in its November issue. The system is usually a collection of unbranded thermostatically-controlled radiators installed without any regard to the particular circumstances or to thermal insulation. These salesmen give undertakings about performance which are falsified in practice and do not appear in the agreements drawn up by their employers. Moreover, the cost is usually much higher than that of a well-installed system provided by a reputable contractor. The Electricity Boards and the Electrical Contractors' Association should find useful ammunition in this report for use against these doubtful concerns.

FACTORY INSTALLATIONS

A series of reports is being published for the Department of Scientific and Industrial Research intended to provide managements with a technical grounding in the various design aspects of a factory and its services. The latest in this series, summarised in this issue, adequately covers at this level the subject of electricity supply and distribution. The importance to management of a knowledge of this subject can well be appreciated as the initial cost of an electrical system may represent some 20 per cent of the total building cost, making it one of the most expensive single items. Moreover, it has been estimated that the cost of the electricity used can represent up to 5 per cent of the manufacturing cost of a product. The main consideration in the choice of a system will naturally be the cost: the correct system to give the service required at the lowest overall cost per unit of final product, including capital charges, maintenance and running costs.

To achieve this the system must be reliable to ensure continuous supply to essential loads and require the minimum isolation of sections for maintenance; and flexible to meet extra loads imposed by building extensions or larger machinery in the original area, and the requirements of any revised production layouts. The report covers these points comparatively thoroughly. Many of the technical details actually necessary in the design of an installation are, however, omitted and so, as is admitted, the report does not replace skilled advice but merely aims at assisting in its understanding.

TRANSFORMER OIL TREATMENT ON SITE



By **F. HUGHES**, F.R.I.C., A.F.Inst.Pet.*

The increasing size of individual power transformers has resulted in their being delivered either gas filled or under vacuum and filled with oil on site. As part of its normal delivery service, Manchester Oil Refinery, Ltd., operates the mobile oil processing unit described in this article. The author gives details of the equipment and its use during initial transformer filling and in transformer drying operations

THE stringent control criteria applied to transformer oil, more so than with any other refined petroleum product, demand that the quality provided by refinement must be maintained until the electrical equipment is commissioned. The time interval between manufacture and use is often considerable and, until recently, electrical equipment was invariably filled with liquid insulant where it was constructed, the manufacturers maintaining optimum quality by applying some form of treatment immediately prior to, or concurrent with, filling. The problems of fractional contaminant ingress associated with container filling, transporting, refilling, sampling, etc., could be corrected.

With the present trend towards increased size of electrical equipment, particularly of large power transformers, such corrective or safeguarding action by the manufacturer is not always possible. Large transformers are now delivered to site either gas filled or under vacuum to be filled *in situ* from bulk road tank vehicles and it is only to be expected that the volume of oil filled at the erection site will increase with time. The problem of maintaining optimum quality from oil refining to filling the equipment in such circumstances devolves upon the transformer oil supplier, who may resolve the difficulties in either or both of two ways: first, to ensure that the properties of the fluid do not change in transit by imparting to the fluid measured electrical characteristics superior to those required in service to provide a quality reserve, or alternatively to provide at site equipment suitable for oil conditioning.

Irrespective of the method used, the need exists for facilities for transformer oil testing at site. As part of its normal delivery service for high quality transformer oil, the Manchester Oil Refinery, Ltd., operates a mobile processing plant and laboratory fully staffed for continuous 24-hour duty. The mobile transformer oil servicing unit comprises filtration, high-vacuum dehydration and de-aerating equipment: the only type of equipment able to maintain high electrical properties and possessing testing facilities. This, or similar equipment provided by the transformer manufacturer, is essential for high vacuum filling at site. It has been used for filling most of the 120 MVA, 275/132 kV transformers so far erected in the United Kingdom, to apply corrective treatments, to improve the electrical properties of insulating oil and to remove relatively large amounts of water from wet oil/equipment systems.

Mobile Unit

Conditioning treatments, i.e. filtering, degassing, and dehydrating, are most effective when applied under vacuum. At reduced pressures, free and dissolved water may be evaporated and dissolved air expelled at low temperatures without harming either the oil or the solid insulation. The conditioning rate depends upon the method employed: the larger the oil surface exposed to vacuum, the more rapid the rate. The mobile unit combines the advantages of a large evaporation surface by spraying fine oil droplets, and a turbulent flow with high vacuum of about 0·1 mm Hg abs. Since it includes heaters designed for a low transfer rate (0·5 W/sq cm) and rapid oil circulation, local overheating of the oil is avoided and the unit has adequate flexibility to perform any process required at site.

Fig. 1 shows a line diagram of the unit connected to a transformer. The primary filter (1) includes a coarse filter with a removable element to eliminate large contaminants and to protect the gear feed pump. This pump (2) is rated at 3,300 gal/hr and is fitted with vacuum shaft seal. The oil heater (3) is thermostatically controlled

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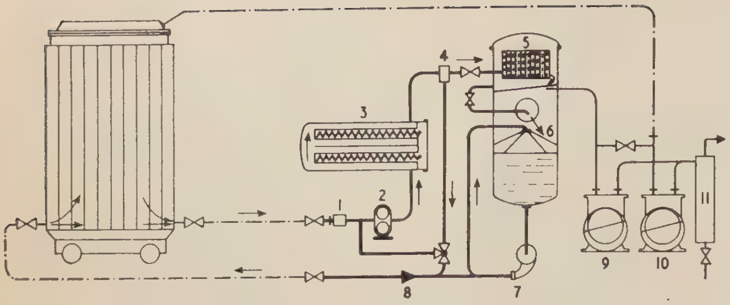


Fig. 1.—Diagrammatic arrangement of the unit connected to a transformer

1. Primary Filter. 2. Feed Pump. 3. Oil Heater. 4. Flow Regulator. 5. Filter Press. 6. Vacuum De-gassing Chamber. 7. Circulating Pump. 8. Non-return Valve. 9 & 10. Vacuum Pumps. 11. Condenser.

and has three stages with a total rating of 98 kW, enabling the oil temperature to be raised to 100°C. The flow rate through the filter and degassing chambers is controlled up to 1,100 gal/hr by the flow regulator (4). This maintains a constant flow independent of the filter resistance. Surplus oil is diverted through a by-pass into the delivery pipe or back into the suction side of the feed pump (2). The filter press (5) has a vacuum-tight housing and the oil passes through papers to remove the smallest foreign particles. The press may be refitted with papers whilst the plant is running. The vacuum degassing chambers (6) are maintained at 0·1 mm Hg by the vacuum pump (9). Filtered oil is sprayed as fine droplets through the high vacuum region.

A centrifugal circulating pump (7) draws filtered, degassed oil from the base of the vacuum chamber (6) and feeds it back to the main oil stream. A non-return valve (8) prevents the plant from flooding with oil from the transformer or storage tank when the plant is at rest. The vacuum pump (9) has a capacity of 58 cu ft/min; it evacuates the degassing chamber (6) and delivers the extracted air and water vapour through the condenser (11) to an exhaust pipe. It is fitted with an air-ballast device to prevent vapour condensing in the pump. Another similar pump (10) may be coupled to the transformer tank when drying out or to the oil storage when conditioning. It may also be paralleled with vacuum pump (9) to accelerate the degassing and drying processes. The condenser (11) provides a means whereby a drying operation can be observed from the amount of condensate produced from the vapour delivered by the vacuum pumps.

High Vacuum Filling

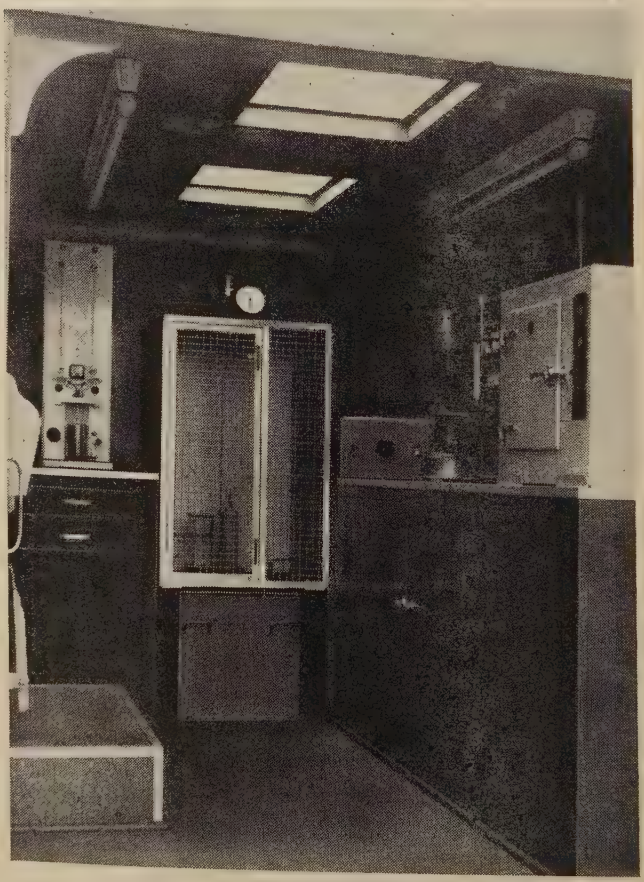
Filling up to 80 tons of insulating oil on site is a joint operation where the overall responsibility rests with the transformer manufacturers' engineer-in-charge. The techniques applied are as required by the manufacturers and at the time dictated by site conditions. It is one process in an erection programme and may be considered as involving three stages: filling under high vacuum (e.g. below 10 mm Hg abs.) to cover the windings and requiring some 12,500 gal; topping up, not necessarily under vacuum, after additional erection work; and filling ancillary equipment, radiators, conservators, etc.

The first stage is the most important step, to be completed ideally in daylight at any time of the year and as rapidly as possible without the transfer of air or moisture to the transformer. Two factors influence the filling rate: first, vacuum pump capacity to maintain the requisite high vacuum and, secondly, low air content for the insulating oil. Using insulating oil conditioned and degassed on site in the delivery vehicles, it has been possible tc fill a transformer at 2,500 gal/hr when vacuum pump capacity of 100 cu ft/min has maintained the absolute pressure in a 120 MVA transformer below 10 mm Hg. In this instance both of the two high vacuum pumps, each with a capacity of 58 cu ft/min, were used. When they were not in parallel the filling rate was 1,300 gal/hr. No data are available to indicate the filling rate under the same conditions when the transformer oil had not been given an additional conditioning treatment (at 1,000 gal/hr) on site, but a higher air content would appreciably reduce the filling rate because of the longer time required for pressure equalisation to 10 mm Hg.

Provision of a portable meter and oil-filled, self-sealing, quick-acting coupled hoses, enabled a measured quantity of conditioned insulating oil to be fed rapidly to the equipment without any contamination or air ingress. Later examination of oil samples showed that the high level of electrical properties had been maintained in the tanks. Typical test data obtained during the filling of a 120 MVA transformer under high vacuum are recorded in Table 1.

Corrective Treatment

The need to apply some form of corrective treatment to insulating oil, new or in service, may be recognised by the crackle test, electric strength, or from its appearance. In dealing with the maintenance of insulating oil, B.S. 171:1936, Amendment No. 4: June, 1951, Appendix M, requires that a measured electric stress of 30 kV for one



The van interior is fitted out as a mobile laboratory minute should be withstood and moisture, detected by crackle, should be absent. The recognition tests give qualitative indication of the condition of a fraction of the insulating oil which is invariably non-representative of the whole. Generally, they indicate the presence of a content of contaminant such as water, fibre, dust, rust or scale, all components insoluble in the fluid. The tests do not give quantitative information of the extent of contamination and hence of the extent of corrective treatment required. In many instances removal of the local contamination to provide an acceptable quality may be achieved by removing a small quantity of insulating oil from the container outlet or simple filtration which effectively ensures adequate freedom from solid impurities.

TABLE 1.—TRANSFORMER OIL CHARACTERISTICS ON H.V. FILLING

Reference	As Delivered	After Conditioning	From Transformer
Sampling Point	vehicle outlet	vehicle outlet	drain valve
Neutralisation No. mg. KOH/g.	0·03	0·03	0·03
Water Content (Fischer) p.p.m.	19	15	15
Electric Strength			
(a) 50 kV/1 min.	Pass	Pass	Pass
(b) 60 kV/1 min.	Fail	Pass	Pass
Breakdown Voltage kV	56	78	72
Resistivity at 70°C MΩ × 10^6 ...	34	38	35
Air Content %	8·1	3·7*	—

* The air content of transformer oil may be still further reduced by continued vacuum treatment.

When purifying equipment has not been available the mobile servicing unit has been employed to apply corrective treatment by a combination of filtration and vacuum treatment, if necessary at high temperature. The purifying processes include passing finely divided oil through a low-pressure region (0·1 mm Hg abs.). A single pass through the equipment at 800 gal/hr has been found to be adequate to improve electrical properties, remove insoluble contaminants and degas/dehydrate.

Typical data for transformer oil in service before and after treatment at 20°C on a single pass are as follows:—

Measured test	*Before treatment*	*After treatment*
Electric strength 30 kV/1 min	Fail	Pass
Breakdown voltage kV	28	75
Neutralisation No. mg.KOH/g	0·10	0·10
Appearance	Solids present	Solids absent
Crackle test	Fail	Pass

Wet Transformers

Large transformers are fitted with a dehydrating breather, intended to prevent moisture from entering the system, but these are only partly effective and many operating transformers contain appreciable quantities of water. Any water entering the transformer as damp air, first dissolves in the insulating oil and is subsequently absorbed by kraft paper and pressboard solid insulation. Whilst water dissolved in oil has little effect upon the fluid's electrical properties, on migration it can profoundly affect the dimensional stability of solid insulation. Although kraft paper insulation is usually introduced to a transformer with moisture content around 0·1-0·4 per cent, several months of continuous service can result in an increase to 2-7 per cent or even higher. Until the use of moisture resistant synthetic fibre becomes more common, the problems of wet transformers and consequently of paper insulation in not maintaining its mechanical integrity when the environment changes will continue. Thus in drying operations it is not only necessary to remove from the equipment moisture dissolved in oil but also some of that adsorbed in solid insulation.

Often it is not easy to decide whether or not to dry a transformer since, in any electrical equipment, it is not possible to obtain samples of liquid or solid insulation which can be tested to provide representative, quantitative information. Whilst a K. Fischer moisture content, determined on an oil sample taken at operating temperature, can (providing the observed value is less than the maximum solubility and hence water is homogeneously in solution) afford a reasonably accurate method of estimating the total quantity of water which may be removed from the oil, the technique cannot be applied to solid insulation. In the absence of mechanical insulation failure, measurement of insulation resistance can indicate if a transformer is dry by comparing the observed data with reference data obtained in early service life.

The unit has provided an effective means for drying transformers on site, particularly those overhauled after a long period of service or where known contamination

TABLE 2.—ELECTRICAL PROPERTIES OF MODEL INSULATION IMMERSED IN OIL CIRCULATING THROUGH THE UNIT AT 90°C

Time Hr	Pressboard Roll Model				Kraft Paper/Copper Conductor				
	D.c. Resistance (85 V) MΩ		Capacitance 1 kc/s pF	Water Content	D.c. Resistance 500 V MΩ × 10^6		Dielectric Loss Angle		Water Content %
	10 sec	60 sec		%	10 sec	60 sec	1 kc/s	50 c/s	
(24°C)	*320	*300	385	4·9	0·032	0·030	—	—	5·9
0	2·1	2·1	910	—	0·025	0·025	0·062	—	—
20	1·1	1·2	1,200	—	0·08	0·08	0·030	0·129	—
50	0·67	0·68	1,520	3·5	0·21	0·22	0·017	0·073	1·3
100	0·44	0·44	1,620	—	0·54	0·54	0·007	0·047	—
146	0·44	0·44	1,640	—	0·50	0·62	0·006	0·042	1·1
200	0·44	0·44	1,670	—	0·44	0·43	0·005	0·036	—
270	0·60	0·61	1,600	2·4	0·34	0·39	0·004	0·040	0·6

* At 500 V d.c.

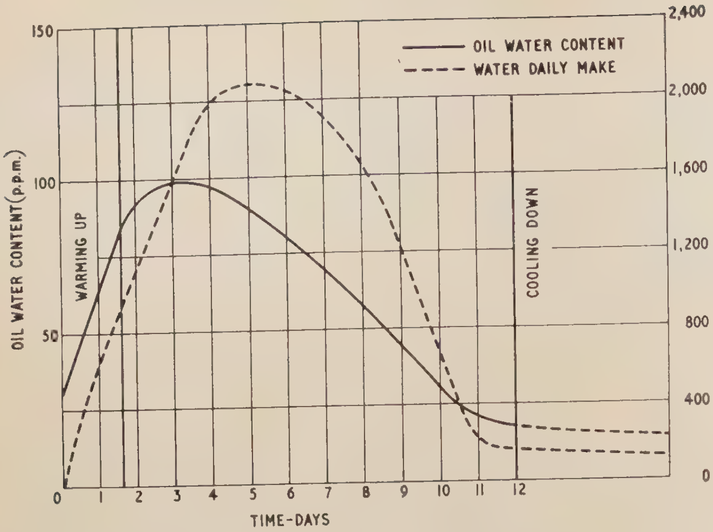


Fig. 2.—Water distribution during drying a 64 MVA transformer in 12 days

with water has occurred. Transformers having airtight tanks should be kept under high vacuum and heated, not by energising the transformer windings because of the danger of overheating the oil, but by continuous rapid circulation through an external heater system. With the unit's 98 kW heaters it has been found practical to raise the temperature of very large transformers to 95°C and, with modest tarpaulin lagging, maintain this temperature. Fig. 1 shows the line arrangement of the unit when drying a transformer. At 1,100 gal/hr processing rate, dehydration occurs when oil is sprayed into a low-pressure region at 1 mm Hg abs. Under these conditions water evaporates and is expelled, through a vacuum pump fitted with a gas ballast device, to be condensed and removed. Experimentally, it has been proved that at 95°C water equal to 100 p.p.m. added to 1,100 gal of dry insulating oil can be recovered with a 90 per cent yield at the unit condenser in a time equivalent to 12 passes through the vacuum chamber. Since the oil was dry on completion and the condenser is small, the excess water was exhausted as damp air at the vacuum pump exhaust.

It is only to be expected that, whilst oil may be dried rapidly by high vacuum treatment, to dry solid insulation would take longer because it has to be desorped against the forces of capillary attraction. In a practical trial it was found that the moisture content of kraft paper wrapped around copper conductor strips was reduced from 6 to 1·3 per cent in 55 hr when immersed in transformer oil at 90°C continuously circulated through the unit high vacuum spraying chamber. At the same time the water content of outer layers of a coiled pressboard model insulator was reduced from 5 to about 3·5 per cent. Concurrently, there was observed a measurable improvement in electrical properties, d.c. resistance and dielectric loss angle of the model insulators. Illustrative data are recorded in Table 2.

The trials proved that the unit equipment quantitatively dehydrated insulating oil in a short time and measurably reduced the moisture content of solid insulation without any adverse effect upon the transformer oil properties. The technique has been used to dry large transformers where water was known to be, or suspected of being, the cause of impaired efficiency.

Usually during a preliminary warming-up period oil was continuously heated and circulated but without including the vacuum spraying/dehydrating facilities in series. For wet systems, water was immediately transferred to oil by dissolution and its determination by the K. Fischer method enabled the minimum content available for removal from the transformer to be calculated. When the drying section was included in the circuit, the water in oil measured remained at a level somewhat below maximum solubility for several days, whilst water was continuously condensed and collected. This showed that water was migrating from the solid insulation, in some instances at rates as high as 2-3 litres/day. The transformers were considered as sensibly dry when after several days no water was condensed concurrently with the circulating oil being found to be dry.

TABLE 3.—DATA ON DRYING TRANSFORMERS

Transformer No.	1	2	3
Rating	45 MVA, 132 kV/ 33 kV	15 MVA, 132 kV/ 66 kV	10 MVA, 33 kV/ 6·6 kV
Oil capacity gal	9650	3600	3000
Warming up period hr	36	12	16
Water content before processing, max. p.p.m.	186	90	65
Drying time days	6·5	9·2	5
Drying temperature °C	85–90	74–86	83–85
Vacuum applied inches	18	16	None
I.R. (HV-E) MΩ			
(a) Initial	150 (15·5°C)	32 (13°C)	50 (20°C)
(b) Before processing	4·3 (86°C)	1·5 (74°C)	0·7 (88°C)
(c) After processing	4·3 (90°C)	1·9 (78°C)	1·4 (88°C)
(d) After cooling	250 (15·5°C)	580 (21°C)	80 (20°C)
Resistivity at 70°C MΩ × 10^6			
(a) Before	0·06	0·14	0·16
(b) After	0·07	0·12	0·60
Final water content of oil p.p.m.	22	18	10
Total water collected litres ...	11·2	13·4	5·2

Fig. 2 presents two typical distribution curves indicating the amount of water condensed and content of the circulating oil stream on drying a 64 MVA transformer holding 9,000 gal of transformer oil in 12 days. Table 3 gives an outline of the data obtained in drying three transformers. In all instances, concurrently with drying the equipment and improving i.r., the electric strength of the oils was increased very considerably and was above 75 kV breakdown value.

This mobile unit enables an efficient conditioning and drying process to be applied to transformer oil in a short time on site. It is likely that, in the future, more widespread use of this and similar units will be required to provide the highest attainable quality of insulating oil at the operating site.

The author is indebted to Mr. R. Dean for obtaining much experimental data and wishes to thank the directors of the Manchester Oil Refinery, Ltd., for permission to publish this article.

MEASUREMENT IN ELECTRICITY SUPPLY

By L. B. S. GOLDS, M.I.E.E., F.R.S.A.*

In considering the need for ever greater efficiency in electricity supply and the desire to relate tariffs to costs, there is an increasing dependence upon measurement in one form or another. This article presents in an unbiased way the various factors which make measurement, and metering in particular, a vital function in an expanding electricity supply organisation, as well as a worthwhile and fascinating job for the young engineer

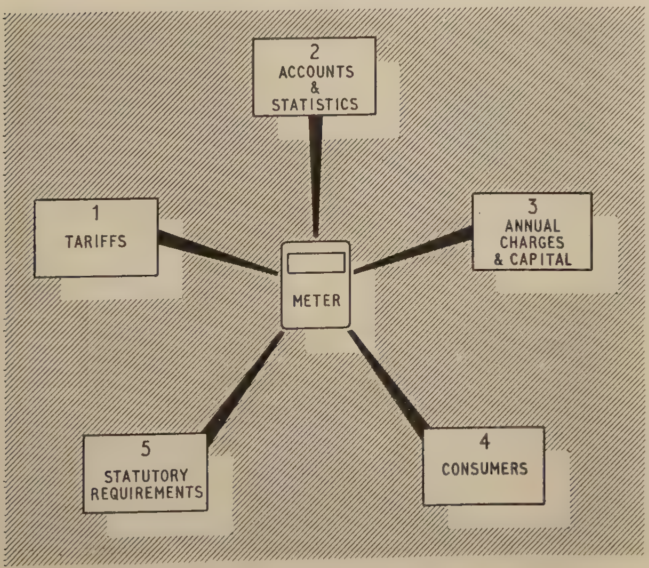
IT has been put forward by its detractors that the meter is unnecessary and in any case is far too accurate. The main component of electricity tariffs is the charge based on the kilowatthour or " unit." Although the standing charge under two-part tariffs is based on fixed costs these amount on average to only about 30 per cent of the domestic electricity account. Of course, when two-part tariffs were first introduced, in order to build up the load, the proportion of the income from fixed charges was high in relation to that from the " unit " charge. This was due to the fact that the tariff had not yet made its impact and the consumption of electricity of most consumers was much lower in those days.

Tariffs

With the introduction of off-peak and multi-rate tariffs where the price per kWh is so low that the margin of profit is small, it becomes even more essential to ensure that the consumption is correctly measured. Furthermore, it is necessary in such tariffs to provide reliable means for controlling the time of switching of the meter registration. For this purpose superimposed signals on the supply network may be employed to a greater extent in the future and this would involve working in close collaboration with the distribution engineer.

From time to time various methods have been proposed for eliminating the use of a meter in tariffs by introducing a load limiter or a similar device operating on a load basis, but, except in the case of fixed loads such as street lighting where a time switch is mainly used to control the consumption, the kWh meter is a cheap and effective method of charging and thereby controlling the consumption, provided the meter is maintained. It also has the advantage of allowing the consumer to use what he likes provided he pays the appropriate price.

This diagram indicates the channels through which the meter serves the industry



Accounts

The readings of meter registration translated into money amount to nearly £600 million annually in England and Wales. The meter is therefore a link in the accountancy chain which enables the undertaking to continue in business. Closely allied with this is the fact that a measure of the undertaking's progress is the number of " units " sold. If the accuracy of the meters as a whole is low this will be reflected in the unreliability of the statistical statements of the industry upon which many things, including staff salaries, are partly based. As meters generally tend to under-register with time rather than over-register, such inaccuracy will affect the overall statistical picture.

Annual Charges on Capital

The total capital requirements for power stations, substations, mains, transformers, showrooms and the like are very large. The annual charges on this capital could not, however, be met without the revenue derived through the tariffs based on the measurement of the electricity consumed or power taken as measured by meters or maximum demand indicators respectively. The capital expenditure on this latter equipment is relatively small, but, as previously stated, the revenue derived from the metering is around £600 million annually.

Satisfying the Consumer

The consumer's contact with the undertaking is at the meter. The consumer relies upon the meter accuracy to give him " a square deal " and in the event of the electricity account being disputed, the registration of the meter is usually the first point of attack. About 70 per cent of all domestic consumers have consumptions less than the annual average for this large group of consumers, but the average and the money value of the energy consumed is increasing so that it is more and more necessary that the meter should be accurate.

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* Eastern Electricity Board.

Very few engineers, apart from those intimately connected with metering, realise the nature of the technical and administrative machinery set up by virtue of the 1936 (Meters) Act and by subsequent legislation. It may not be generally realised that the undertaking's methods of meter maintenance are the subject of comment and scrutiny by Ministry of Power meter examiners and the meter engineer has therefore to perform his duties under the day-to-day technical surveillance of a Ministry official. It must be added that, in general, the relations between the Ministry examining staff and Area Boards' staff are good. To describe in detail the method of working of certification procedure would be out of place. However, in outline, it amounts to all apparatus such as primary standard potentiometer equipment, indicating wattmeters, current transformers, stop watches, clocks, and secondary standard watthour meters, as well as the testing circuitry, either conforming to a specification or being under the surveillance of a meter examiner, and being subjected to a National Physical Laboratory test.

The service meters are calibrated and certificates with the actual results of tests are submitted to the examiner who, at his discretion, selects certain meters amounting nominally to 5 per cent of the batch. These meters are re-connected to testing circuits by the meter station staff after which the examiner makes check tests. If any meter is found having errors at specified test loads exceeding the statutory tolerances of 2½ per cent fast or 3½ per cent slow, that meter, and possibly the whole batch, is rejected depending upon the degree of variation of the test figures from the meter stations, and upon the results of a second sample taken from the batch submitted.

The examiner may also be required to carry out tests and decide cases where any "ordinary" consumer disputes the accuracy of the meter installed on his premises. In these cases the examiner ascertains whether the meter is registering the total consumption over the period in dispute within the statutory tolerances.

The 1936 (Meters) Act was promulgated when there were about 600 undertakings operating and when in general the metering function was appreciated only by a small number of the undertakings. It is now open to question whether or not the time has come for a review of the procedure.

In addition to the foregoing, meters have to be of a type and pattern approved by the Minister (as advised by the National Physical Laboratory) and have an accuracy performance within the limits stated in the current edition of B.S. 37.

The foregoing analysis serves to emphasise the importance of the metering function within the organisation, which is often overlooked. Two reasons for this may be given. First, the relatively small number of staff engaged; second, continuity of supply and safety are not directly involved.

Maintenance

Any measurement is subject to errors and, in the case of electricity meters, these errors grow larger with time and in such a way that the consumption is generally under-registered, i.e. more "units" are used than are actually recorded. This is recognised by the fact that the present statutory tolerances are 2½ per cent fast and 3½ per cent slow. There are, therefore, two main factors which control the service or maintenance period of meters. First, the statutory period—at present 15 years—during which meters must register the consumption within the said tolerance; second, the need to reduce the "units" under-registered to an *economic minimum.*

Qualifications of the Meter Engineer

There is probably no group of supply undertaking employees for whom the problem of proper relations with consumers is of greater importance than the meter engineer. This is because a large part of the meter engineer's work is directly associated with the consumer and, in particular, the industrial consumer. The manner adopted by the meter engineer may affect the consumer's judgment of the supply undertaking. The meter engineer especially should therefore be courteous, straightforward, businesslike and concise, bearing in mind that the business of generating and supplying electrical energy is, to the layman, peculiarly technical and mysterious. He does not understand it and resents its apparent mystery.

It is important for him to have a thorough grounding in electrical technology. He should also be conversant with the general problems affecting supply arrangements, switchgear and short-circuit conditions, all of which may affect the metering performance, the annual sums of money involved often amounting to tens of thousands of pounds. He must also have a detailed and special knowledge of electrical measurement theory and technology, including electronic techniques which are becoming increasingly used in electricity metering schemes and testing rigs.

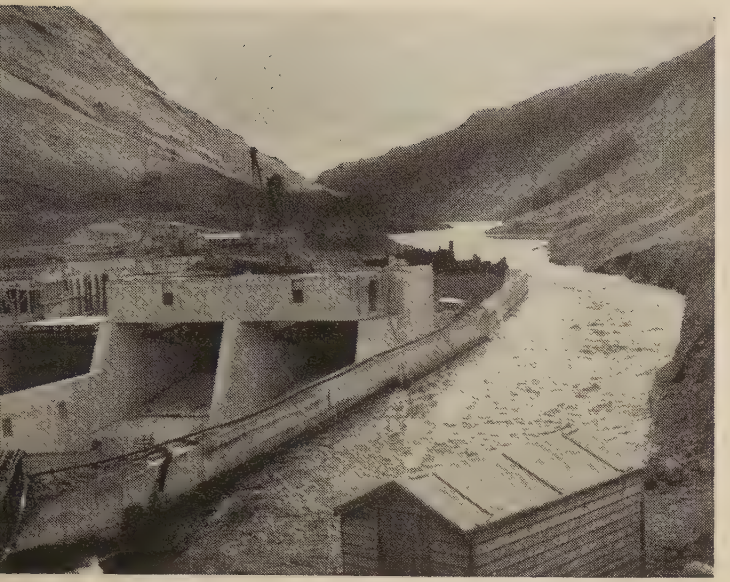
The statutory tolerances of meters are relatively large as compared with other weights and measures, mainly because of the large number of variables which affect the measurement as well as the increased costs involved in attaining closer tolerances. Nevertheless, in order to achieve the present limits of error, even with modern meters, the tolerances on secondary standard apparatus must not exceed approximately one-tenth of the statutory tolerances and on primary standards about one-hundredth of those tolerances. This entails work of high precision and skill. In addition, a knowledge of statistical theory is of great value in an understanding of the problems involved and in judging where economies can be achieved.

Nuclear Electronics Symposium

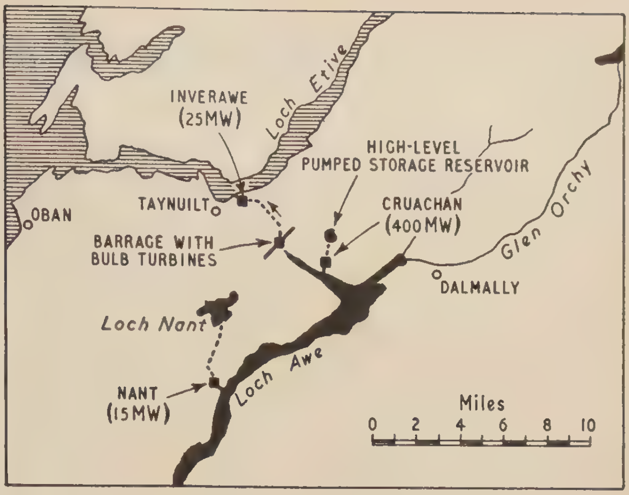
A TWO-DAY symposium on nuclear electronics arranged by the Measurement and Control Section of the Institution of Electrical Engineers is now taking place in London. The symposium is intended to follow up the conference on the same subject held by the International Atomic Energy Agency in Belgrade in May of this year.

The three sessions of the symposium are dealing with "Radiation Detectors," "Electronic Circuits and Techniques" and "Radiation Monitors and Instruments," respectively. At each session a report on the subject of the relevant papers presented at Belgrade is being given, after which other speakers are dealing in more detail with subjects which they themselves presented there, or are giving their own appraisal of the impact of the Belgrade conference on current researches in this country.

LOCH AWE PROJECT



The barrage at the outlet of Loch Awe under construction in the Pass of Brander, Argyll. The barrage will house two 695 h.p. "bulb" type hydro-electric units operating under a net head of 22·5ft



Map of the Awe scheme

THE North of Scotland Hydro-Electric Board's constructional scheme No. 28, the Awe Project, received Parliamentary approval in May, 1959. The £24·5 million scheme comprises two conventional hydro-electric power stations, Inverawe (25 MW) and Nant (15 MW), a barrage with two 695 h.p. "bulb" turbines at the outlet of Loch Awe and the 400 MW Cruachan pumped storage installation. A description of the "bulb" turbines appeared in our issue of 20th October last, while particulars of the machines which are being provided for Cruachan were published on 18th August.

Cruachan power station is situated underground and will be connected with the high level reservoir by a 3½ mile long tunnel 23ft 6in high. The high level reservoir is 1,200ft above the level of Loch Awe which will be used as the low level basin of the pumped storage scheme. In contrast to the three machine units (motor/generator, turbine and pump on the same shaft) at Ffestiniog, the four 100 MW Cruachan machines will each be two machine units (motor/generator and a single reversible pump/turbine). Two units are being supplied by the English Electric Co., Ltd., and two by Associated Electrical Industries, Ltd. The two pump/turbines associated with the A.E.I. section have been sub-contracted to Boving & Co., Ltd.

The electrical and mechanical consulting engineers for the scheme are Messrs. Merz & McLellan and the civil consulting engineers are Messrs. James Williamson & Partners.

The access tunnel leading to the Cruachan pumped storage underground power station. When completed, the station will contain four 100 MW reversible pump/turbines

The site of the high level reservoir where a buttress type dam is to be constructed. The photographic illustrations on this page were taken on 8th November

Power System Analysis

Authors' summaries of two papers presented before a meeting of the Supply Section of the Institution of Electrical Engineers on 22nd November. The first paper was on "Electronic Analogue Computer Simulation of Multi-Machine Power System Networks," by Mr. A. S. Aldred, M.Sc., Ph.D., A.M.I.E.E.* Mr. J. G. Miles, B.Sc.(Eng.), A.M.I.E.E.,† presented the second paper on "Analysis of Overall Stability of Multi-Machine Power Systems"

A STUDY of the behaviour of multi-machine power system networks, involving the variety of operational conditions that occur in practice, is a formidable task to attempt on a laboratory scale. The a.c. network analyser has been used so far for this purpose in which inductance, resistance and capacitance of the system are represented by similar components in the analyser on a much reduced scale. This has provided an acceptable analogue for the complex interconnecting networks, but there remain serious difficulties concerning adequate representation of the synchronous machines and their associated equipment. Some of these difficulties are:—(a) The introduction of saliency, decay of field flux linkages and damper winding effects; (b) the representation of voltage regulators and governor action; and (c) the reproduction of the dynamical characteristics of the generators during transients.

Consequently the information obtained from a.c. network analyser studies is dependent on the validity of a large number of assumptions. Furthermore, the techniques that must be employed to solve transient stability problems are extremely time-consuming.

Naturally, the inadequacies of network analysers for system studies have prompted the development of analogues for the synchronous machines, and many attempts have been made to render network analysers automatic.[1,2,3,4] However, the majority of these machine analogues have been developed specifically for use with existing network analysers and many retain the conventional synchronous machine assumptions. The more successful attempts have involved the coupling of d.c. electronic analogue circuits, that represent the machines, to the analyser through amplitude and phase modulating devices, resulting in a hybrid a.c.-d.c. representation. This tends to be a rather cumbersome procedure and presents a formidable problem unless a number of assumptions are again introduced.

Analogue Computer Method

The increasing availability of electronic analogue computers of large capacity has enabled the problem of multi-machine simulation to be reconsidered from the point of view of using them to simulate complete power systems. This would have a number of advantages over existing methods, the most important being, in addition to solving the difficulties outlined in (a), (b) and (c) above, as follows:—(1) D.c. operation throughout, resulting from the use of a common type of reference frame for all components of the system; (2) flexibility in changing system parameters and versatility in simulating additional elements, for example, dynamic loads; (3) high-speed and repetitive operation, together with a relatively short programming time; and (4) a general-purpose machine is used which may be employed for problems other than power system networks, for example, the study of the dynamical characteristics of nuclear reactors.

The principles on which this new approach is based are, first, to select a common type of reference frame that is applicable, for the purpose of mathematical analysis, to all the components of the power system whether they be machines, transformers, transmission lines or loads. Secondly, to develop analogue circuits for each component from the particular equations arising from the use of this reference frame. Thirdly, the selection of one of the reference frames in the system as the basic frame to which all the dependent variables are ultimately referred and, finally, to interconnect each analogue circuit so that the complete system is simulated.

Reference Frames

The common type of reference frame used by the author (Dr. Aldred) is that developed by Park,[5] following earlier work by Blondel[6] and Doherty and Nickle,[7] for the analysis of synchronous machines. This is known generally as the direct and quadrature axis, or cross-field, reference frame and consists of two axes at right-angles rigidly fixed to the field structure, the direct axis being in line with the pole axis of the machine. There may be other reference frames that are more suitable from some points of view, for example, the freely rotating frame of Kron,[8,9] but preference is given to Park because, in general, engineers are more familiar with his equations than with Kron's. It has been observed by the author that the Park frame can be used to analyse all components of a power system and also that the resulting equations are ideal for simulating on an analogue computer.

The selection of one of the reference frames as the basic frame to which all dependent variables are referred is conditional on the presence or otherwise of a point in the system that may be regarded as an infinite busbar, for if such a point exists it is automatically selected. However, if an infinite busbar is not present then the problem is more difficult and a considerable freedom of choice is introduced. For example, one could select either the

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† Associated Electrical Industries, Ltd.

largest machine in the system or the one that is thought to be the most stable, or a reference frame that rotates at the average speed of all machines in the system, or an arbitrary reference frame that rotates at a fixed speed in space. An inspection of the particular power system that is being analysed may suggest an obvious choice, but if any doubt exists then, in general, the largest machine is probably the most suitable. Much work, however, remains to be done on analysing systems by means of the different approaches outlined above.

A second important advantage that obtains when an infinite bus is present is that it restricts the steady-state speed of all the generators to one per unit, and acts as a stabilising influence by virtue of supplying synchronising torque or consuming excess generated power. Consequently, it greatly facilitates the problem of ensuring a torque balance on all the rotors during normal operating conditions, which otherwise would require the introduction of analogue circuits that simulate the action of speed governors.

The final point concerns the transformations, between the different rotor axes, that must be introduced when machines are interconnected. This may be illustrated by considering the mechanism of transforming the axis currents i_{d2}, i_{q2} of, say, the second machine into the reference frame of machine No. 1, where they become i_{d2}' and i_{q2}'. The equations are

$$i_{d2}' = i_{d2} \cos \delta_{12} - i_{q2} \sin \delta_{12} \ldots\ldots\ldots\ldots\ldots (1)$$

$$i_{q2}' = i_{q2} \cos \delta_{12} + i_{d2} \sin \delta_{12} \ldots\ldots\ldots\ldots\ldots (2)$$

where δ_{12} is the angle between the reference frames of the two machines. These equations are simulated by the use of a servo-resolver, the input to which is the angle δ_{12} and this is obtained from the analogue circuits of the two machines, so that a system involving n generators will require $n-1$ servo-resolvers.

Overall Stability

The following is a summary of the second paper by Mr. Miles:--

As the voltage levels and line loadings of power transmission systems increase it becomes essential, so as to obtain the maximum return on the very large capital invested, that the transmission capabilities of these systems should be utilised to the maximum extent. It follows that the margins of safe operation must be accurately known and possible means of improving these margins carefully studied.

As transmission distances are extended, the limitations on line loading are increasingly set by considerations of system stability, both as it is affected by major disturbances such as faults and line switching (" transient " stability) and also by the continual small variations in load inherent in normal system operation (" steady-state " stability).

It has been customary in the past to consider these two aspects of system stability separately and to assume the system to have overall stability if both checks are satisfactory. Because of the complexity of the analysis various factors have deliberately been ignored, among them the effects of machine saliency, flux variation during the swing, damping in its various aspects, and the effect of voltage regulators and governors. Studies have, in general, been restricted to " yes/no " assessments of system stability at specified loading conditions and with specified disturbances.

These simplified analyses have, however, been shown by operating experience to provide an acceptable basis for the design of systems not required to operate near their stability limits. When operation at higher specific loadings becomes economically desirable, a more accurate knowledge of the margins of overall stability must be obtained. Such analysis is considerably more complex and requires the use of large-scale computational equipment.

A generalised set of equations has been written, describing the transient behaviour of a multi-machine system following a disturbance, including the various factors normally omitted from conventional studies. These equations are suitable for either digital or analogue calculation. In this approach, the transmission system is reduced to an equivalent network of transfer impedances between all equivalent machines and neutral.

The number of equivalent machines which can be represented depends on the scope of the computing facilities available. For currently available computers, a convenient upper limit is five machines, of which four are fully represented and one is an infinite source. It follows that during the network reduction some combination of generating units may be necessary to obtain a suitable number of equivalent sources. This grouping would be based on preliminary load flow and transient stability studies carried out on the unreduced network.

In the I.E.E. paper, the results of a stability study of a representative transmission system made by this approach are described. The primary purpose of this study was to determine for the system concerned the magnitude of the errors introduced by the various assumptions made in conventional stability studies.

Two distinct types of system disturbance were considered: the first a system fault followed by the switching out of the faulted circuit, and the second a sustained load change. In each case the system behaviour was observed with various degrees of detail in the representation of the machines and various combinations of regulators and governors. A summary of the results is presented below.

System Fault

The introduction of transient saliency, while it increases the initial rotor angle, does not significantly affect the form of the swing curve. The maximum rotor angle reached during the swing is increased but, due to the different form of the power/angle relationship, the degree of stability is not seriously affected.

Representation of transient saliency, damping, and flux decay gives a result which is slightly less stable on the first swing than that obtained by allowing for transient saliency alone. In comparison with the former case, the result obtained by allowing for transient saliency and damping without flux variation is optimistic, while that allowing for transient saliency and flux variation without damping is pessimistic. In the latter case, the effect of the reduction in flux during the first swing predominates over the damping due to the field circuit.

The presence of a high response voltage regulator on the machine nearest the fault gives rise to a noticeable improvement in the system stability during the first swing, and the presence of a governor on the same machine has a smaller but perceptible effect on the stability following the first swing. The presence of voltage regulators and governors on other machines in the system has negligible effect on the stability of the machine nearest the fault.

The effect of a sustained load change on the network was simulated in the studies by a step increase in the mechanical power input to machine No. 1. For each case considered, the magnitude of this change was gradually increased until a limiting value was reached at which synchronism was lost. Depending on the particular assumptions made, this loss of synchronism could occur either on the first swing or on subsequent swings.

The value of load increase at which synchronism is lost on the first swing in any particular case indicates the transient stability margin (in terms of maximum permissible load change) available at the initial operating condition and with the specified assumptions of that case, and the total load value after the change can be regarded as a transient stability limit.

Similarly, a value of load increase which causes synchronism to be lost at a considerable period after the disturbance (in relation to the machine time constants) indicates the available margin of steady-state stability, and the corresponding final load value constitutes a steady-state stability limit.

Loss of synchronism on subsequent swings can evidently be observed only when this effect occurs at a value of load change less than the transient stability limit as defined above, but in such cases the method enables the steady-state stability margin to be determined with good accuracy.

The results of these studies substantiate those of the fault studies, and give a better quantitative indication of the degree of stability in the various cases. They indicate that the limit obtained with conventional assumptions lies approximately mid-way between that obtained by full representation of the machines, without regulator or governor effects, and that obtained by including these. In the regulator assumed for the purpose of the studies described, excitation limits were not represented, and it can therefore be concluded that transient stability limits obtained with normal assumptions are substantially correct for wound rotor machines equipped with conventional regulators and governors.

From this representative study, the following conclusions can be drawn:—(a) Correct representation of the various factors referred to is of importance when determining the stability margins of systems operating near their stability limits under the control of high response regulating and governing systems; (b) in such cases the correct representation of generating sources electrically close to a system disturbance is of more importance than that of those remote from the disturbance; (c) transient stability studies made with normal network analyser assumptions give substantially correct results for systems composed predominantly of wound rotor machines equipped with moderate response excitation systems.

BIBLIOGRAPHY

[1] Van Ness, J. E. "Synchronous Machine Analogues for Use with the Network Analyser." Transactions of the American I.E.E., 1954, 73, Part 3-B, p. 1054.

[2] Kaneff, S. "Dynamic Operation of an A.C. Network Analyser." *Proc. I.E.E.*, Paper No. 1847S, October, 1955 (102 A, p. 597).

[3] Aldred, A. S., and Doyle, P. A. "Electronic Analogue Computer Study of Synchronous-Machine Transient Stability." *Ibid.*, Paper No. 2015S, June, 1956 (104 A, p. 152).

[4] Corless, K. G., and Aldred, A. S. "An Experimental Power System Simulator." *Ibid.*, Paper No. 2673S, October, 1958 (105 A, p. 503).

[5] Park, R. H. "Two Reaction Theory of Synchronous Machines, Generalised Method of Analysis—Part I." Transactions of the American I.E.E., 1929, 48, p. 716.

[6] Blondel, A. E. "Synchronous Motors and Convertors." (McGraw Hill, 1913.)

[7] Doherty, R. E., and Nickle, C. A. "Synchronous Machines I—An Extension of Blondel's Two Reaction Theory." Transactions of the American I.E.E., 1926, 45, p. 912.

[8] Kron, G. "A New Theory of Hunting." *Ibid.*, 1952, 71, Part 3, p. 859. (See also discussion by Heffron on page 863.)

[9] Heffron, W. G., Jr., Rosenberg, G. M., Jr., and Rothe, F. S. "Generalised Hunting Equations of Power Systems." *Ibid.*, p. 1095.

Precision Industrial Instruments

AT a meeting of the Measurement and Control Section of the Institution of Electrical Engineers in London last week there was a discussion on the accuracy and precision required in industrial electrical instrumentation. The opening remarks were made by Messrs. P. M. Clifford and A. Felton who defined the difference between "accuracy" and "precision." Precision related to the sharpness with which an indication could be read and included a factor dependent upon the constancy of the indication for a given stimulus. Accuracy was a measure of the exactness with which the indication denoted the true value of the quantity measured. Thus, precision was a necessary prerequisite to accuracy, but it did not guarantee accuracy.

Not many years ago the chief use of electrical measurement in industry was to ascertain the consumption of energy from the mains, and for this purpose an accuracy of the order of one per cent was good enough. Nowadays, however, in the mass production of components for missiles, computers and similar devices a higher precision and usually a higher accuracy were needed. Thus, the voltage output of a generator might be required to be linear with speed to a precision of parts in 10^4 and the actual voltage might have to be known to an accuracy of the same order.

The electrical quantities that often had to be measured in today's factories included resistance, resistance ratio, direct current, voltage and voltage ratio: on a.c. they included power, voltage and current at power and audio frequencies, impedance, phase angle and frequency. Measurements on the shop floor were made with instruments which had been calibrated against the works standard, which itself had been calibrated by the National Physical Laboratory. Sometimes the chain of measurement was even longer. It was desirable that each step should be ten times as accurate as the one that followed it, but this was a counsel of perfection, and in practice ratios of 5 : 1, 3 : 1 or even 2 : 1 had sometimes to be accepted.

When examining a component for conformity with a specification, there were two procedures possible. The component could be gauged by a "go, no-go" method or it could be measured. In the first case the errors of the gauge were not allowed for and the specification tolerance must be correspondingly reduced: in the second case the known errors of the measuring instrument might be taken into account, but choice of method was ultimately a matter of economics.

INDUSTRY AND THE HOUSE

Government and the Nationalised Industries

By AUSTEN ALBU, M.P., B.Sc., A.M.I.Mech.E., M.I.P.E.

RELATIONS between Ministers, Parliament and the boards of nationalised industries formed the main centre of controversy in the House of Commons last week—and it cannot be said that Ministers came well out of it. Although it is stated that the Chancellor of the Exchequer received full support in the 1922 Committee of Tory back-benchers for trying to continue the wage pause, the Prime Minister had a most uncomfortable quarter of an hour on Tuesday last week when he reported his displeasure with the chairman of the Electricity Council for granting a new wage award to the employees in the electricity supply industry.

Sir Robertson King seems to have taken a leaf out of the book of Lord Citrine, whose independence of spirit was sometimes a thorn in the side of the Labour Government. But then the electricity industry is not dependent on Government funds to cover deficits in its annual accounts or to pay for services provided for social reasons, and it is financing a substantial part of its expansion out of its own surpluses. This give the Council a degree of independence not possessed by the Coal Board or the Transport Commission.

Wages and Earnings

The Government have got themselves into an impossible position. Apart from the injustice of a wage policy which can only be applied to those over whom the Government has direct control, it does not make sense to refuse an increase in an essential industry which is losing workers because its wages are too low in relation to those paid in other employment. As Mr. Fred Lee pointed out, in manufacturing industry wages are not the same as earnings, which are increased by payment-by-result schemes not available to workers in the service industries. The Prime Minister completely missed this point.

Mr. Gaitskell pointed out the impossibility of trying to carry out a policy of wage restraint without the full agreement of both sides of industry, with which the Prime Minister agreed; but in reply to an attack from Mr. Grimond on the ground that the Government had no long-term policy for wages, dividends and profits, he got rattled and made the astounding suggestion that the gentle Liberal leader was advocating " a kind of Fascist society, where we impose our will." Not unnaturally several Tories were angry that the chairman of a nationalised industry should have defied the Government. Mr. Nabarro demanded to know what steps were being taken to prevent a repetition of this action in the coal industry and the railways and Dame Irene Ward asked whether the chairman of the Electricity Council had told the Prime Minister that he did not agree with his policy at the time it was first outlined.

The Prime Minister emphasised that, although he regretted the decision, it would be dangerous for the Government to make themselves responsible for the precise wage agreements of all nationalised industries. An indication of the confusion which now exists on wages policy was pointed out by Mr. Lee, who reminded the House that the Minister of Labour was signing awards made by Wages Councils for operation from 2nd April. Was the wage pause, he asked, to finish then ? The difference between 28th January and 2nd April hardly seemed worth such a display of Ministerial bad temper.

Mr. Gaitskell complained that the Council had had no opportunity to present its point of view to Parliament and therein lies the rub: for, although the Prime Minister claimed that the Government had no statutory powers to settle wages in a nationalised industry, there seems little doubt that they could have given the Council a written direction in the national interest, not on the specific issue but on general wage policy. But if they had done so they would have had to publish their direction and they would have been responsible for any effects arising therefrom. They could then hardly have prevented the Council from making known its own views and the Government's action could have been debated in Parliament.

It is the fact that in every case of this kind in the past the Government of the day has got its way by a system of private arm-twisting of Board chairmen that has so far prevented disagreements between them being made public. This is the system that the Select Committee on Nationalised Industries has condemned in report after report, when it has demanded that Boards should be allowed to exercise their commercial judgment and, when required to do something not strictly in their economic interest, should be given formal directions to do so.

Transport Bill

Most of the cases criticised by the Committee have been related to prices or charges or to the operation of uneconomic services and it was to the latter that several members referred in the debate on the Transport Bill and none more strongly than the retiring chairman of the Committee, Sir Toby Low. He repeated the Committee's case that it was not the business of Dr. Beeching to decide what services should be run for social or general economic reasons, but that of the Minister of Transport, who should provide the funds to pay for them. Only in this way could there be a measure of financial discipline in the affairs of the railways and the House of Commons be able to exercise a proper degree of accountability over the nationalised industries on the one hand and the Ministers who dealt with them on the other. This doctrine has not yet received universal support and Mr. Strauss said that it would involve great difficulties as he thought that at least half, and probably more, of the services now run by the railways were uneconomic.

Mr. Marples annoys railwaymen, of whom there are many on the Labour benches and a few, including the Prime Minister, with his director's gold pass, on the Government side. On this occasion his uninspired reading of his speech explaining the Bill infuriated Scotsmen who are worried by the large number of branch lines north of the border which are to be closed. For 40 years or more railway supporters have been fighting a defensive battle in Parliament: an ironic commentary on their early attempts, with the Road Locomotives Acts, to strangle their main competitor at birth.

But the chief strength of the Opposition attack lay in their criticism of what they conceived to be a break-up of the machinery of a co-ordinated transport system for the country. This was originally represented by the British Transport Commission and Mr. Strauss doubted whether the proposed National Transport Advisory Council was really any substitute for it. This doubt was repeated by Mr. Ray Gunter, winding up for the Labour Party, who called in aid a speech by Dr. Beeching to the Institute of Transport in favour of transport planning, but pointed out that Dr. Beeching now had no authority over the private sectors of transport without which planning and co-ordination were impossible. Mr. Gunter went on to support the views of the Select Committee and seemed to be daring Dr. Beeching to emulate the new-found spirit of independence among Board chairmen and to tell the Government that if they wanted to keep uneconomic lines open they would have to pay for them. He went on to point out that this was not only a social problem but one which had to be considered in a wider economic context, especially in the great areas of population.

It was left to the earnest Sir Edward Boyle, Financial Secretary to the Treasury, to explain the details by which the Treasury assumes responsibility for servicing outstanding British Transport stock to the tune of £1,444 million and the Commission's liability to repay Exchequer advances made for capital purposes to the amount by January, 1963, of about £700 million is abolished In addition the obligation to repay loans made to meet revenue deficits is extinguished, involving an amount of approximately £300 million. The net result of these and previous actions is that when the new undertakings created by the Bill come into being they will assume liability for about £1,975 million of assets between them of which the railways' share will be £1,575 million. However between a third and a half of that debt, representing the written down value of the assets created before the modernisation plan, is to be placed in suspense. The Government has had to face up to the realities of railway economics in the modern age with a vengeance and, in one way or another, will have to go on paying for a large number of services for a very long time indeed.

CUMBERLAND TERRACE CONVERSION

THE conversion by the Crown Estate Commissioners of the Nash houses in Cumberland Terrace, Regents Park, London, into a number of self-contained flats is now nearing completion. The south block has in fact been completed and is now occupied. Provision has been made for the full use of electricity, for all purposes, within the flats and altogether the total installed electrical load of the terrace amounts to nearly 2,000 kW. Although, externally, the terrace looks almost as Nash originally planned it in 1780, the buildings have been completely stripped and reconstructed.

Each flat has "Panelec" underfloor electric heating throughout, as well as on the lift landings and corridors, and the total installed floor warming load amounts to 650 kW. It is connected to anticipatory control units, specially made for the contract, and supplied off-peak. The heating is under landlord's control, and is separately metered, the cost being included in a service charge.

The kitchens have a sink water heater, a cooker control panel, five socket outlets wired on a ring circuit, an extract fan, and provision for a waste disposal unit. A gas point is provided in case a gas cooker is preferred. The bathrooms, the only rooms without natural lighting, have 30 gal water heaters, heated towel rails, a point for an electric shaver, and a heater/ventilating fan in the ceiling.

There are three electric laundries, available to tenants on an hourly basis, each having a 100 gal water heater loaded at 9 kW, of which 6 kW is used as a boosting load in operation only when washing is in progress. Other laundry equipment includes washing machines, tumbler dryers, spin dryers and rotary irons.

Adequate provision is made for the use of portable electrical appliances inasmuch that a typical two-bedroom flat has 21 socket outlets in addition to those provided in the kitchen, while the three-bedroom type has 31. In certain rooms a section of skirting board is removable and a loop of cable is left so that a tenant can have an additional socket-outlet installed later.

Exterior view of the south block of the Nash houses in Cumberland Terrace, which is now complete and occupied. On the right is shown a kitchen of one of the flats, which is equipped with a "Creda" water heater, G.E.C. cooker, "Prestcold" refrigerator and an extract fan

VIEWS on the NEWS

By "REFLECTOR"

A MONTH or so ago I suggested that in publishing their financial results the Electricity Boards, in defiance of orthodox accountancy, should announce surpluses *after* deducting revenue contributions to capital expenditure. Since then the same idea has been put forward in other quarters. For instance, a correspondent in *The Times*, dealing with the internal financing of the industry, says:—

> "There remains the problem of convincing consumers and employees that the surpluses were not available for reducing prices or raising wages. This would presumably involve a departure from conventional accounting. Perhaps the Minister could issue a directive requiring that specific sums or proportions of revenue should be allocated to 'above the line' contributions to capital development."

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Makers of a washing powder have unwittingly helped to counteract falling electrical appliance sales. They ran a "bingo" competition by means of cards in their packages, but something went wrong and the customers of a store in a small Norfolk village all found themselves able to claim prizes. These included 80 refrigerators and washing machines, as well as food mixers and other things: one customer won three refrigerators. No wonder the storekeeper reported that he had sold three months' supply of washing powder in three weeks.

* * *

I have been invited to "Yell for Light" and later to ask for "Light for Yell." Yell is one of the Shetland Isles and it has a Development Council which seeks to free the 1,280 inhabitants who are said to be still "slaves of the paraffin lamp." The Council wants help in "pressurising" the Government and the North of Scotland Hydro-Electric Board to provide mains electricity for the island as the first step to rehabilitation. It is said that this could be done for "a mere fraction of the money spent on aid to under-developed countries." Much as Yell has my sympathy, I have to remember that it is only one of the numerous islands which expect the Hydro-Electric Board to serve them. The Board is also deserving of sympathy in its colossal, unenviable and expensive task.

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A grim addition to the electrical equipment of American homes is foreshadowed in the *Electrical World* (New York). This is the national emergency alarm repeater for which the Pentagon is said to be issuing specifications shortly. This instrument, costing between $5 and $10, would form a 3 W load operated at 1 V. The central station equipment would cost between $20,000 and $100,000 in each case. I am not sure that I quite appreciate the way in which the commercial aspect is stressed. It is said that

> "the home receivers should create about a $1-billion manufacturing market, while the central station transformers would create an additional $50 to $60-million market. Present equipment and appliance manufacturers would use the government-held patents and specification to build the units, and then bid to sell them to power systems."

* * *

In Bombay the electricity supply authorities, apparently at the behest of the Government, limit individual domestic loads to 5 kW. Protesting against this restriction, a writer in the *Indian Electrical Contractor and Trader* says:—

> "In a highly congested city like Bombay the tendency is to use electricity for all the domestic purposes, once the supply main is laid for the building. The reasons are obvious; cleanliness, quickness and the equipment occupies less space; no spirit, no matchbox is required and one can control the current from the maximum required to minimum required. Also the rate is not yet increased per unit as against three times increase in kerosine and four times to five times in charcoal. The interior of the house remains clean and also there is no buying of bad and often wet coal."

He suggests that a scale graduated according to floor area, without an upper limit, could be introduced without prejudicing the supply.

* * *

Eighty years ago there was a great deal of experimentation in electric traction. Two systems are mentioned in the following note from the *Electrical Review* of 1st December, 1881:—

> "A tram-car on a new electrical system will be soon experimentally run from one end to the other of the Rue de Rennes, Paris. The electric current will be conducted along the inner face of the rails. There will therefore be no wire supported on poles. The scientific world is greatly interested in this experiment. There are electricians who predict the failure of the tram-car in wet weather. The success of the Siemens Electrical Railway has been so great that the Municipal Commission appointed to report on the possible application of electricity will advise the experiment of an elevated railway in some part of Paris. The only objection to the erection of such a line on the Boulevards is its aspect, which it is supposed will not be sufficiently ornamental. A large number of practical suggestions will be made by this Commission."

Electricity in Factories

BUILDING RESEARCH STATION REPORT

A SERIES of twelve reports is being prepared by the Building Research Station of the Department of Scientific and Industrial Research. They are intended to provide factory managements with a sufficiently comprehensive initial reference for briefing specialist consultants in the design of factory installations, and for checking the efficiency of existing installations. The subjects covered include the general design and the lighting, noise, fire protection, thermal insulation and economic aspects of factory planning. The latest in the series to be produced, No. 10, published by H.M. Stationery Office, price 3s 6d, deals with electricity supply and distribution in factories.

After explaining such terms as power factor, maximum demand and load factor, the report considers the size of a factory load and meeting it by private generation or from the public system. Typical load densities, expressed as kVA of maximum demand per 1,000 sq ft of production floor area, are given in the table. It is pointed out that the total increase in industrial consumption in Great Britain is nearly 10 per cent per year, which will result in the load at least doubling during the life of the distribution equipment. Private generation is stated to be economical only if very large amounts of electricity are required, if a standby supply is essential, if a waste product can be used as fuel, or if there is a demand for l.p. steam for processing. In other cases the supply is most likely to be obtained from the local Area Board, and the various voltages and tariffs available are discussed.

TYPICAL FACTORY LOAD DENSITIES
(Maximum Demand kVA per 1,000 sq ft of production floor area)

Type of Industry	No. of Factories in Sample	Average Load Density	Range of Load Density
Hosiery	4	3·9	3·0–5·5
Steel Fabrication	5	6·0	3·8–12·4
Light Assembly	9	6·2	4·9–9·8
Clothing	8	6·5	5·0–10·3
Textiles	7	7·7	5·4–11·9
Wire and Cable	4	7·8	6·9–18·2
Precision Engineering	4	8·8	3·8–12·4
Heavy Engineering	7	13·4	8·2–21·3

Planning the Distribution System

The next section covers distribution within the factory. The cost of a distribution system depends on five main items, the cables and switchgear at the primary and secondary voltages, and the transformers. Graphs in the report show how the cost of each of these items varies with the capacity of the circuit. The relationship of these items suggests that as great a distance as possible should be covered with primary voltage cables, to keep the secondary voltage cable short. Further, the primary voltage should be as high as practicable. Also to keep the secondary voltage cables short, the substation should be placed at, or very near to, the " load centre " of the area it serves. Substations of small capacity should be used within the economical range. By using four small substations to supply a square load area, rather than one large one, half the secondary voltage cables will be saved. The distribution system should, of course, be as simple as possible and proper equipment of good quality must be selected.

In factories with a maximum demand over 100 kVA, the distribution system usually starts from a single substation with a capacity somewhat larger than the load, to provide for future expansion. In factories with maximum demands above about 5,000 kVA several substations may be used, distributed around the perimeter of the factory. When the maximum demand is below 100 kVA both the supply and the distribution system will be at 415 V, and generally the distribution board is at the point where the supply cable enters the building.

The choice of voltage for the primary side of a load centre substation distribution system is limited for practical purposes to the standard voltages of 3·3, 6·6 or 11 kV. In most cases where there are no large motors, the supply voltage, which is generally 11 kV, will be the most economical one for primary distribution. Where a high proportion of the load consists of large motors which can operate at 3·3 kV, this voltage should be considered for the primary circuits, the motors being supplied direct from a main substation. The proportion of the load that can operate at this voltage is critical, because the cost comparison involves the whole system and not only the motors and starters at the alternative voltages. The choice of secondary voltage will almost invariably be 415 V, three-phase, giving 240 V between phase and neutral in a four-wire system.

The report continues by discussing the relative merits of radial and ring distribution circuits at both primary and secondary voltages, and of the possible wiring systems, including metal sheathed or armoured cable, cable in conduit, cable in underfloor or overhead trunking and cable-tap systems, and busbar trunking. The final choice depends on both the load to be supplied and the number of outlets required. Generally with increasing load, the economic advantage passes from mineral insulated metal sheathed cable or cable in conduit through p.v.c. insulated armoured p.v.c. sheathed cables to paper insulated lead covered and armoured cables. With increasing load and an increasing number of outlets the trend is from mineral insulated metal sheathed cable through cable in trunking and cable-tap systems to busbar trunking.

Another section deals with the use of synchronous motors and capacitors for power factor improvement and finally reference is made to various regulations governing factory installations.

Medium Frequency Power

Mr. L. E. Squire, A.M.I.E.E., the author of the article on " Medium Frequency Power," published in last week's issue (pages 827-33) is now with Induction Furnace Installations, Ltd., 92, High Street, Hampton Hill, Middx. On page 830 of the article after the sentence beginning " Some objections were raised to this design on the grounds that the bearing loads were high . . ." it should have been stated that experience has not shown these objections to hold good.

. . . for Lighting, for Switchgear for quality, for service, choose Simplex

The Simplex General Purpose Floodlight Projector is available in narrow beam, wide angle, and elliptical beam types. The heat resisting glass front is set in a weatherproof ring.
150w—2000w lamps.

The Simplex Airflo high-bay fitting is extremely light to handle. Its one-piece spun aluminium reflector is self-cleaning. The Simplex Discon device included with this fitting allows instant connection to the conduit system.
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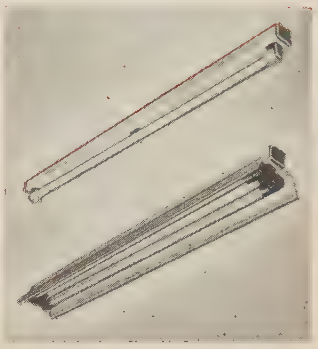

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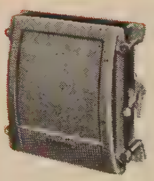

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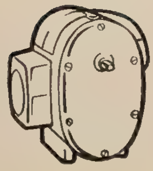
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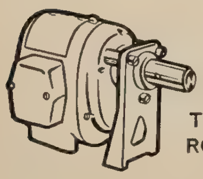
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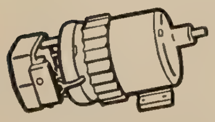
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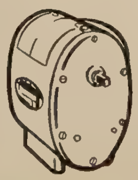
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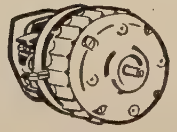
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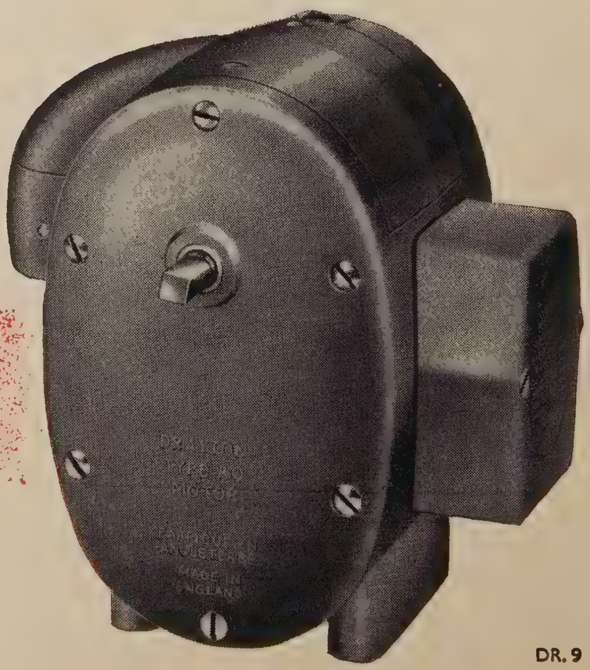

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DR. 9

Left to right: **1.** *Mr. F. H. Smethurst (national dinner organising secretary) being received by the president, Mr. H. J. Fraser and Mrs. Fraser.* **2.** *Sir Christopher Hinton (chairman, Central Electricity Generating Board) and Lady Hinton.* **3.** *Mr. A. R. Cooper (member, C.E.G.B.), Dr. R. S. Edwards (chairman-designate, Electricity Council) and Mr. A. M. F. Palmer at the reception with Mr. C. T. Melling (member, Electricity Council) in the background.* **4.** *Mr. S. J. Alger (vice-president, E.P.E.A.), Mr. S. A. Fuller (president-elect, E.P.E.A.), Mrs. Alger and Mrs. S. B. Sumner.* **5.** *Mr. D. Gray and Mr. J. T. Grundy.* **6.** *Mr. H. J. Bennett (regional director, Eastern, London and South Eastern Region, C.E.G.B.) and Mrs. Bennett*

Electrical Power Engineers

THE thirty-fourth annual dinner and dance of the Electrical Power Engineers' Association was held last Friday at the Connaught Rooms, London, when nearly 500 members and guests were present. The chairman, Mr. H. J. Fraser, M.I.E.E., president of the E.P.E.A. (commercial engineer, Liverpool Central District, Merseyside and North Wales Electricity Board), proposed the loyal toast.

In proposing the toast to the Association, Mr. R. S. Edwards, D.Sc.(Econ.), chairman-designate of the Electricity Council, wondered why he, an economist, had been asked to perform this function while among those present was the greatest living engineer [Sir Christopher Hinton] and greatest trade unionist [Lord Citrine]. It was probably charity, he said. Amplifying Bernard Shaw's remark that if all economists were put end to end, they would not reach a conclusion, he said that the real worry was that two economists would probably come to three conclusions. Therefore, said Dr. Edwards, he would refrain from discussing relations between nationalised industries and the Government.

Responding, Mr. Fraser said that the majority of the Association's members were engaged in the electricity supply industry which, despite any efforts of nationalisation, still remained essentially an engineers' industry and a key industry of the nation. Arising from increased efficiency, the average price per kWh sold to consumers was reduced for the second year in succession. In relation to the overall level of retail prices today, electricity was probably the cheapest item the consumer was purchasing at the present time. The Association had always been non-political and could therefore criticise the Government. Mr. Fraser thought that the Chancellor was ill-advised to put an extra tax of 2d per gallon on fuel oil as this was likely to cost the supply industry an extra £11 million in a full year. The authority's accounts for 1960-61 indicated that the vast sum of £385 million had been found for the self-financing of capital requirements from depreciation provisions, surpluses, and other internal resources. This represented no less than 45·6 per cent of total capital requirements and, apparently, the Chancellor considered that this figure was still too low. Mr. Fraser thought that self-financing to this extent put a heavy burden on the supply industry and might be partly the reason for the Generating Board having to put up their kW demand charge from £7 7s to £8 next year.

It was good to record, said Mr. Fraser, that the Generating Board was finding peaceful uses for atomic energy. It was also good to record that the Board was allocating 45 per cent of its capital expenditure in the next financial year to nuclear development.

After a short interval for clearing the hall, the rest of the evening was devoted to renewing acquaintanceships and to dancing.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Electric Shock Treatment

I WAS interested to read the views expressed by Dr. Gilbert in your issue of 10th November, but of the six items of criticism listed, three of the factors, those concerning gassing and drowning, are not likely to be met with in cases of electric shock.

Of the remaining three, the second can hardly be applied to the majority of people as I hope we are not all permanent carriers of disease.

With regard to the fourth criticism, and particularly as in industry such mouth-to-mouth artificial respiration will be by one man to another and also as a reasonable standard of health is maintained in industrial workers these days the chance of damage to lungs is surely very remote.

We in industry are therefore left with the " not nice " aspect which I am sure can be overcome even by such a simple expedient as placing a handkerchief or piece of clean rag over the patient's mouth.

I agree with the comments regarding apparatus in that methods which do not rely on any apparatus are the most useful in times of emergency. This then rules out the use of a resuscitator with the Holger Nielsen method. It has also been found essential with the Holger Nielsen method to have refresher courses for industrial workers every 18 months to two years and this is expensive in time and money, but with the mouth-to-mouth method, once it is taught, particularly with the use of a dummy, then it is not likely to be forgotten.

Great Sutton, Wirral, Ches. G. E. SHEPHERD.

Dr. Gilbert has seen a copy of Mr. Shepherd's letter and replies as follows:—

I am glad to see that Mr. Shepherd is taking a keen interest in mouth-to-mouth artificial respiration. My short article on this subject was not meant to be a fully comprehensive and complete text, but to arouse just such interest. In the present state of knowledge I feel sure that the mouth-to-mouth method does not supersede the Holger Nielsen nor can it be ignored. It certainly has its place in the field of treatment of asphyxia, particularly for those casualties to which access cannot be obtained to perform Holger Nielsen artificial respiration, such as those fixed in a trench or pipe or partially covered by a fall of stone or debris from a collapsing building. There are also those who are lying face upwards and so badly injured that it would be dangerous to turn them. In electric shock cases it might well be a matter of choice.

Many of the criticisms of the mouth-to-mouth method have been overcome but some still remain. I agree with Mr. Shepherd that " mouth-to-mouth " is now easily taught with the aid of models and that a handkerchief placed over the mouth and face may possibly take away some of the revulsion of doing mouth-to-mouth and may protect to some extent against the transmission of infection.

This transmission either way, i.e. casualty to operator or the reverse, cannot be totally ignored. It is not a very great risk admittedly and one which would have to be taken if mouth-to-mouth had to be performed, but the case is on record of a midwife who transmitted tuberculosis to twelve infants by mouth-to-mouth artificial respiration on asphyxiated new-born babies. Placing a handkerchief over the face and mouth may help a little.

I fear that damage to the lungs, especially " overblowing " of the lungs and thereby tearing or bursting them, is a real possibility. Post-mortem examinations on cases where lung inflation has been done show that this type of injury is not uncommon. Teaching proper pressures on a model may, in time, overcome this.

The whole subject of artificial respiration is at a most exciting and interesting stage, and mouth-to-mouth quite rightly is slowly fitting into its correct place.

Gateshead. HERALD J. GILBERT, M.B., B.S.

Over-Age Installations

THE leader in your issue of 24th November suggests that the Electricity Boards should be more active in helping people to have their electrical installations tested and in offering assistance to meet the costs arising when re-wiring or extensions are required.

A month or two ago the South Western Electricity Board introduced an experimental service for the inspection and testing of consumers' installations on a rechargeable basis and although in the first place this has only been given publicity in one or two pilot districts the facility is available throughout the Board's Area. For a fee of 30s (applicable to premises of up to ten rooms) we check insulation resistance, earth continuity resistance, earth loop impedance and polarity as well as the fusing or the effectiveness of any circuit-breakers installed as the case may be: so far as appliances are concerned, our inspection is confined to the safety aspects only.

There are many reasons why Electricity Boards are unlikely to re-introduce the assisted wiring schemes of bygone days, but in the case of my own Board we offer deferred payment terms either with maximum repayment periods of up to four years, where the Board provides the finance, or up to five years for larger installations under the personal loan scheme which we operate in conjunction with a private finance company.

Apart from meeting most of the criteria as regards service which you enunciate in your leader, I think I should emphasise that we have been careful in all our dealings with this problem to have regard to the fact that this is a field in which the Boards are competing with private contractors and that, so far as practicable, charges must be formulated on an economic basis.

Bristol.
R. F. RICHARDSON,
Chief Commercial Officer,
South Western Electricity Board.

Liège International Fair

The 14th Liège International Fair is to be held from 26th May to 11th June next year. Among the industrial groups is one embracing industrial electricity and electronics. Particulars are available from Mr. R. C. Liebman, 178, Fleet Street, London, E.C.4, the U.K. representative.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Mr. A. E. Grimsdale, commercial director of A.E.I. (Manchester), Ltd., is joining the board of Nuclear Graphite, Ltd., in place of **Mr. G. S. C. Lucas,** director of engineering, A.E.I. (Rugby), Ltd., and **Mr. E. Tankard** is appointed part-time director (finance). Mr. Tankard is comptroller of the A.E.I. - John Thompson Nuclear Energy Co., Ltd.

Mr. N. G. Leaf has been appointed to the board of Atlas Lighting, Ltd., and will continue to be responsible for overseas marketing of Atlas Lighting products. He will also manage the International Division of the parent company, Thorn Electrical Industries, Ltd. Mr. Leaf has been with the company since 1931 and joined the Export Division in 1953.

Mr. N. G. Leaf

Mr. D. W. V. Parkes

Mr. D. W. V. Parkes, B.Com., has been appointed a director of Tricity Cookers, Ltd. After taking his degree at Bristol University, Mr. Parkes spent five years with the South Western Electricity Board before joining Tricity Cookers in 1955 and he has since successively held the positions of southern area manager, southern sales manager and, since early 1960, sales promotion manager.

Mr. R. E. Norman, M.A.(Hons.) (Cantab.), who at the beginning of this year was appointed chief engineer in charge of all domestic television and radio activities of the Thorn Group, has been elected to the board of the Ferguson Radio Corporation, Ltd.

Mr. A. J. Ellis, general works manager, **Mr. J. Capeling,** works manager, Fluorescent Fittings Division, and **Mr. T. P. Metcalfe,** financial controller, have been appointed to the board of Smart & Brown (Engineers), Ltd., Spennymoor, Co. Durham.

Mr. George Gibson has been appointed to the board of Nash & Thompson, Ltd. Mr. Gibson assumes responsibility for co-ordinating production matters and for the integration of Nash & Thompson activities with those of the Thorn Group. Since 1950 he has been works director of George Forrest & Sons, Ltd. (also in the Thorn Group).

Mr. M. Clissold, manager of the Lyndhurst District of the Southern Electricity Board, is retiring on 20th December after just over 40 years in the electricity supply industry. For many years he was with the Wessex Electricity Co. at Salisbury. In 1949 he went to Yeovil as S.E.B. district manager and in 1953 he took up a similar post at Lyndhurst.

Mr. Clissold will be succeeded by **Mr. A. W. J. Hunt,** A.M.I.E.E., who is at present senior assistant commercial engineer (sales and contracting) on the staff of the commercial officer of the Bournemouth Sub-Area.

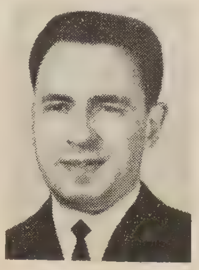
Mr. Hunt, who becomes district manager (designate) at Lyndhurst from 1st December, started as an electrician apprentice with the former Bournemouth & Poole Electricity Supply Co., Ltd., and later joined the Wessex Electricity Co. at Melksham. During the war he served with the Royal Navy, attaining the rank of lieutenant-commander. He was appointed to his present post in 1948.

Mr. R. P. Coombes, Associate I.E.E., succeeds Mr. Hunt. He has been district commercial engineer, Southampton District, since 1958.

Mr. Cyril G. F. Pritchett, of the Chloride Electrical Storage Co., Ltd., has been elected chairman of the Accumulator Makers' Association.

Mr. A. Marshall, production controller of J. G. Statter & Co., Ltd., has been appointed to the new post of field sales manager. Mr. Marshall, who is 42, has been with J. G. Statter for four years. A large part of his career has been spent in Ceylon, selling and installing electrical distribution gear.

Mr. R. G. Tolley has been elected to the board of Simms Motor Units, Ltd. Mr. Tolley joined the group in March, 1960, and later that year he was appointed general manager of the Simms Electrical Division at their new works at Ponders End.



Mr. R. G. Tolley

Sir William Lamond has been appointed chairman of the Calcutta Electric Supply Corporation in succession to the late Sir Harry Burn. **Mr. I. A. Macpherson** has become deputy chairman and **Sir Owain Jenkins** and **Mr. A. R. Colley** have joined the board.

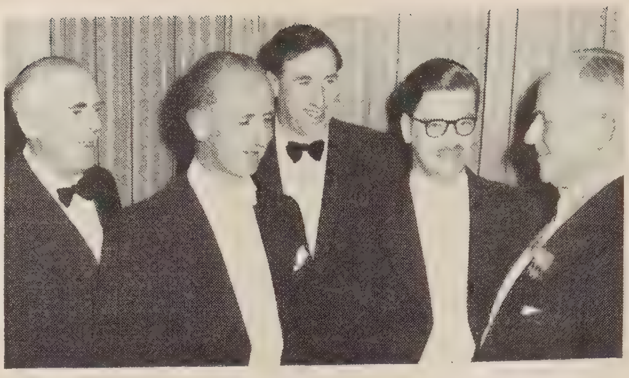
Mr. W. S. Hilton has been appointed electrical and street lighting superintendent to Crewe Council in succession to **Mr. Richard Q. Nicholls,** who has retired after 33 years' service with the Corporation.

Mr. H. D. Garland has been appointed chief engineer of Magnavox Electronics, Ltd. Before joining Magnavox he was chief export radio engineer to Thorn Electrical Industries, Ltd.

The annual dinner of the **I.E.E. Tees-Side Sub-Centre** was held at Saltburn (Yorkshire), and Mr. J. A.

Queen Elizabeth the Queen Mother, in her capacity as Chancellor of London University, greeting Lord Nelson of Stafford, chairman of the English Electric Co., Ltd., on 23rd November, when she conferred on him the honorary degree of D.Sc.(Eng.). The citation stated that his reorganisation of the company "is one of the outstanding achievements of twentieth century British industry"

Tatchell (chairman) presided. Mr. W. B. Duncan, director and chief engineer of Imperial Chemical Industries, Ltd., Billingham-on-Tees, mentioned that the Sub-Centre had nearly 400 members. Mr. C. Robson, president of the Tees-Side Industrial Development Board, spoke of the efforts being made to attract new industries.



At the annual dinner and reunion of the Tees-Side Sub-Centre of the Institution of Electrical Engineers, held at the Zetland Hotel, Saltburn, Yorks, on 10th November (left to right): Messrs. C. Robson (president, Tees-Side Industrial Development Board), T. W. J. Temple (immediate past-chairman, Tees-Side Sub-Centre), W. B. Duncan (divisional director and chief engineer, Billingham Division, I.C.I.), J. A. Tatchell (chairman, Tees-Side Sub-Centre), and Dr. R. L. Smith-Rose, C.B.E. (vice-president, I.E.E.)

Mr. T. F. C. Walker, B.L., B.Sc. (Econ.), A.C.I.S., has been appointed secretary of the Midlands Electricity Board's Birmingham Area, with effect from 11th December, in succession to **Mr. A. Webb,** F.C.I.S., who recently retired. Mr. Walker joins the M.E.B. from the South of Scotland Electricity Board where he has been secretary of the Ayrshire Area for the past six years.

Mr. F. W. Shaw, A.I.M.T.A., sub-area accountant, East Sussex and South West Kent and Mid-Sussex Sub-Areas, South Eastern Electricity Board, has been appointed deputy chief accountant of the Board in succession to **Mr. F. Hardman,** A.I.M.T.A., who retires next March.

Mr. R. G. Riddle, B.Sc.(Eng.), A.M.I.E.E., has been appointed assistant manager of the Small Industrial Machines Engineering Department in the Birmingham Works of the A.E.I. Motor and Control Gear Division. Since 1949, Mr. Riddle has been concerned with all aspects of design of A.E.I. light power machines, including responsibility for engineering associated with the company's factory at Thorne, which was started in 1951. He was appointed assistant manager, F.H.P. Machines Engineering Department, last January.

Mr. Harold Diggle, B.Sc., M.I.E.E., consultant to the Engineering Department at the Wythenshawe Works of the A.E.I. Transformer Division, has retired after 46 years' service. Mr. Diggle joined the former British Westinghouse Co. in 1915, after graduating at Manchester College of Technology, and became engineer in charge of transformer tests. He transferred to the Transformer Engineering Department in 1917, and shortly afterwards was put in charge of transformer engineering development. He was appointed consultant in June, 1960. From 1927 onwards he devoted much of his time to the development of on-load tap changers and he presented a paper on the subject before the Institution of Electrical Engineers. Mr. Diggle has served on a number of B.S.I. and B.E.A.M.A. committees, including those on flameproof enclosures and high-voltage bushings, and he is hon. secretary of the I.E.E. North Western Centre.

Mr. R. G. Riddle

Mr. H. Diggle

Mr. G. T. Kent, B.Sc., A.M.I.E.E., has recently been appointed a director of Herga Electric, Ltd.

Mr. H. Sykes, chief draughtsman, Yorkshire Electricity Board, since 1st April, 1948, has retired after 50 years' service in the industry. He started his career as a stores junior with the Yorkshire Electric Power Co. and continued with that company until vesting day. In recognition of his completion of 50 years' service the Board presented him with a bureau, while his office colleagues presented him with a gold wrist-watch, a pipe and pouch.

Three employees of the **Metal Industries Group** who have each completed 50 years' service were entertained, with their wives, by Sir Charles Westlake, the chairman, in London on 22nd November. They had dinner in a West End hotel, were presented with cheques and commemorative albums and were afterwards taken to a theatre. They were Mr. S. Cheetham (Lancashire Dynamo & Crypto, Ltd., Trafford Park), Mr. P. T. Hockney (Brookhirst Igranic, Ltd., Bedford) and Mr. A. Savage (Brookhirst Igranic, Chester, now retired).

Mr. Edward L. Denny, former chairman of William Denny & Bros., Ltd., presented awards to pupils, students and apprentices of **W. H. Allen, Sons & Co., Ltd.,** Bedford, during the annual prize-giving on 17th November. Sir Kenneth Allen, chairman, who had introduced Mr. Denny, said that because civilisation depended more and more on machinery, it must not be assumed that fewer trained engineers were required. In fact, more engineers were needed and increasing automation would merely accentuate that condition. His company, he said, set out to train engineers in the greatest possible numbers, having regard to the size of the company, and could provide that training against a background of considerable engineering diversity and to a high level of ability.

Mr. L. H. Brueton has been appointed export sales manager of "Servis" domestic appliances (Wilkins & Mitchell, Ltd.). He has previously held the positions of sales promotion manager and assistant sales manager for the "Servis" Home Sales Division.

Mr. L. H. Brueton

The sales director of the new Shipton Group amalgamation, Shipton Automation (Sales), Ltd., is **Mr. Francis Jasper.** Mr. Jasper's experience includes seven years in the communications field.

The Eastern Electricity Board has appointed **Mr. D. Fulcher,** F.C.C.S., secretarial officer at the Fens Sub-Area, to succeed **Mr. E. E. Cooper,** secretarial officer, Essex Sub-Area, who is retiring at the end of the year.

Mr. E. V. Small has been additionally appointed a director of the Blaw Knox Chemical Engineering Co., Ltd.

The **Exeter Electric Club** held its eleventh annual dinner at the Imperial Hotel, Exeter, on 17th November. The toast to "The Club" was proposed by Mr. J. C. Thompson, Director of Electrical Engineering, Admiralty. In response, Mr. S. H. Tombs, president, mentioned that its members could be proud of the harmony and good fellowship which existed within the Club. The toast to

"The Visitors" was proposed by Mr. W. H. Mortimer, vice-president, who was later presented with the Peters Cup and Owen Golf Trophy.

The Central Electricity Generating Board has approved the appointments of **Mr. I. G. Ellis,** M.B.E., as deputy chief personnel officer, and of **Mr. J. F. G. Bland,** B.A.(Econ.), as education and training officer.

Mr. P. Sydney

Mr. Percy Sydney has been appointed as chief commercial officer, Eastern Electricity Board, in succession to Mr. R. H. M. Barkham, who has been appointed deputy chairman of the Yorkshire Electricity Board. Mr. Sydney was previously manager of the Chilterns Sub-Area, and, before that, manager of the Suffolk Sub-Area.

Mr. E. L. N. Towle, B.Sc. (Eng.)Lond., M.I.Mech.E., M.I.E.E., M.I.Mar.E., has been appointed manager, Industrial Applications Engineering Department, Rugby and Manchester, of the A.E.I. Motor and Control Gear Division. He succeeds Mr. B. Pringle, M.B.E., whose retirement was recently announced.

The annual dinner-dance of the **I.E.E. Scottish Centre** was held at the Grosvenor Hotel, Glasgow, on 21st November. Professor E. G. Cullwick was in the chair and the principal toast, "The Institution," was proposed by Mr. D. A. Allan, formerly Director of the Royal Scottish Museum.

Dr. T. E. Allibone, C.B.E., F.R.S., M.I.E.E., has retired from the Southern Electricity Consultative Council.

Mr. N. C. Heathcock

The Midlands Electricity Board has appointed **Mr. N. C. Heathcock,** B.Sc., A.M.I.E.E., as assistant chief engineer (operations and communications) in succession to Mr. E. H. Cox, M.I.E.E., who becomes assistant chief engineer (distribution). Mr. Heathcock, who takes up his new appointment on 1st December, has been deputy area engineer in the Board's Worcestershire Area since 1957. He was joint author with Mr. R. Mallet of an article on "Automatic Circuit Reclosers on Rural H.V. Lines" published in the *Electrical Review* of 28th September, 1956.

The National Institute for Research in Nuclear Science has announced the appointment of **Dr. J. Howlett** as head of the "Atlas" computer laboratory. Dr. Howlett has, since 1948, been head of the Computing Group of the Theoretical Physics Division at the Atomic Energy Research Establishment, Harwell.

More than 100 members and guests attended the annual dinner and dance of the **A.S.E.E. Bristol and West Branch** on 17th November. Sir Hamish MacLaren, who was guest of honour, spoke of the accord which existed between the I.E.E. and the A.S.E.E.

Over 450 apprentices from the Stafford and Kidsgrove works of the **English Electric Co., Ltd.,** received certificates, indentures or merit awards at the nineteenth annual apprentices' presentation which took place on 24th November at the company's Stafford Works. The awards were presented by the Bishop of Stafford, who was the guest of honour.

OBITUARY

The late
Mr. T. Yule

Mr. T. Yule.—We regret to report that Mr. Thomas Yule, M.Eng., M.I.C.E., M.I.Mech.E., A.M.I.E.E., chief project engineer, Southern Project Group, Central Electricity Generating Board, died as the result of a motor-car accident on 23rd November. Mr. Yule, after graduating at Liverpool University, was trained at the Metropolitan-Vickers works and later served the company overseas as an erection engineer. From 1933 to 1938 he was with the Power Division of Imperial Chemical Industries, Ltd., and later held appointments with the Sheffield Corporation Electricity Department, the West Midlands Joint Electricity Authority and Brighton Corporation Electricity Department, becoming deputy engineer and manager of the last-named undertaking in 1945.

Upon the nationalisation of the electricity supply industry in 1948 Mr. Yule was appointed chief generation engineer (construction) of the Eastern Division of the British Electricity Authority. He became chief project engineer when the Southern Project Group was formed in 1958.

We extend our sympathy to Mrs. Yule and their two sons.

The late
Miss G. L. Entwisle

Miss Gertrude Lilian Entwisle, A.M.I.E.E., one of the first women electrical engineers in this country, died on 18th November at the age of 69. From 1915 until her retirement in 1954 she was a designer of d.c. electric motors and generators with the Metropolitan-Vickers Electrical Co., Ltd.

In 1915, when she joined the technical staff of Metropolitan-Vickers from Manchester University (where she studied physics), Miss Entwisle was the first woman to be so employed, and she later had the distinction of becoming the first woman associate member of the I.E.E.

Miss Entwisle was a founder member of the Women's Engineering Society (formed in 1919) and was its president from 1941 to 1943. The Electrical Association for Women grew out of this Society.

Miss Entwisle was a member of the Association's National Advisory Council until her death, and became the first secretary of the Manchester Branch, formed in 1926.

Sir Greville Maginness.—The death occurred on 23rd November of Sir Greville Maginness, K.B.E., deputy chairman of Tube Investments, Ltd., at the age of seventy-three. Sir Greville had a long record of public service, including the presidency of the Machine Tool Trades Association in 1940-43, of the Engineering and Allied Employers' National Federation, 1944-46 and of the British Employers' Confederation, 1946-50.

Dr. A. Wenner-Gren.—A leading Swedish industrialist, Dr. Axel Wenner-Gren, died in Stockholm on 24th November at the age of eighty. Dr. Wenner-Gren had widespread interests. One of his earlier undertakings was the formation of the Electrolux concern. Among his latest was as the progenitor of a large scheme for the development of power from the Peace River, British Columbia. He also earned a reputation for his extensive contributions to charitable causes.

Sir Harry Burn, chairman of the Calcutta Electric Supply Corporation, Ltd., died recently at the age of seventy-three.

INDUSTRIAL NEWS

Permanent Magnet Hearing

THE Restrictive Trade Practices Court last week began hearing the reference by the Registrar of the agreement between members of the Permanent Magnet Association. The agreement fixes the prices at which magnets may be sold by members.

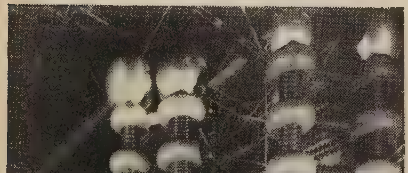
Opening for the association, Mr. T. G. Roche said that the association fulfilled quite different functions from those usually undertaken by trade associations: it formed a patent pool between all the members, in which any patent discovered by a member belonged to the association; it was responsible for a very complete exchange of technical know-how; it operated a central research organisation; it arranged the exchange of costing information; it did valuable work on the standardisation of analyses and products; and it fixed prices for magnets.

There were two special features of this industry. There was a very complicated patent position, the subject-matter was very specialised, and know-how was of the greatest importance. The other special feature was the organisation of the industry in the United Kingdom. Most foreign countries had a few large manufacturers who dominated the domestic industry, but here there were 15 small and medium sized manufacturers.

Total production by value in this country was £2,700,000, of which magnets worth £429,000, or 17½ per cent, were exported. The accountants' figures disclosed that the association's prices were fair and reasonable. They yielded for the years 1956-59 an average profit on sales of 10·7 per cent, and on capital employed on balance-sheet figures 20·2 per cent and on replacement values 15·5 per cent.

The association's case was that it was vital, if the British industry were to compete with the large foreign giants and their licensees, that it should maintain its relative technical efficiency *vis-à-vis* its competitors, and it could only do so if the present arrangements for co-operative co-ordinated research continued. In the absence of price control these arrangements would cease. The reason was that no member would disclose valuable technical information or share a patent with another if the other member could thereby cut his prices and take away the custom of the member giving the information. If the British industry fell behind in technical efficiency, one of the foreign giants would capture the British market and could then have the public at its mercy. Moreover, a drop in technical efficiency would lead to a substantial decline in exports. Further, the association gave its members an indemnity if they reasonably contested patent actions in foreign countries. If a member had to fight a patent action abroad by himself, he might not in many cases think it worth while and would prefer not to export to countries where he had been threatened with infringement of patent actions. The association believed that its co-operative and co-ordinated research had conferred benefits on the consumer.

H.V. Testing Equipment for Russia



A flashover test being carried out on Ferranti d.c. testing equipment at the company's Avenue Works, Hollinwood, Lancs. The equipment, one of a number of test plants being supplied to the U.S.S.R., is designed to give an output of 2,000,000 V d.c.

TWO G.E.C. GROUPS MERGED

TO merge the activities of the Lighting and Heating Group and the Installation Equipment Group of the General Electric Co., Ltd., a new company, G.E.C. (Lighting & Equipment), Ltd., has been formed. This follows the considerable progress already made in the reorganisation of the Lighting and Heating and Installation Equipment Groups. The new company will have manufacturing and other facilities in seven factories at Birmingham, West Bromwich, Wolverhampton, Iver (Bucks.) and Rickmansworth. The total number of employees exceeds 5,000.

The board of the new company will operate from temporary headquarters in Newhall Street, Birmingham, until 1st January, and thereafter the headquarters will be at Lloyd House, Birmingham. Mr. John O. Sewell, who joined the G.E.C. last September after relinquishing his post as managing director of the Yale & Towne Manufacturing Co., has been appointed chairman and managing director. Other directors are Mr. R. H. Phillips (commercial director), Mr. D. L. Tabraham (development director), Mr. G. Beebee (director and secretary) and Mr. K. R. Bond, who also serves on the board of G.E.C. (Home Products), Ltd.

Upon their appointment to the board of the new company, Mr. R. H. Phillips and Mr. D. L. Tabraham relinquish their responsibilities as managing directors of the Installation Equipment Group and the Lighting and Heating Group respectively.

Other management responsibilities within the new company are: Mr. W. G. Williams, sales; Mr. S. A. Ritchie, finance; Mr. E. H. Davison, production; Mr. H. Allen, personnel; and Mr. Ivor Williams, exports.

Electricity Supply Workers' Wages

Details of the recent wages settlement in the electricity supply industry, received from the Electricity Council, show that all manual workers with two or more years' service on 28th January next will be placed on an "upstanding" weekly wage consisting of 42 times the revised grade rate (2d an hour more) plus the following weekly additions according to group:—A, 5s; B, 5s 6d; C, 6s; D, 6s 6d; E, 7s; F, 7s 6d; G, 8s; and H, 8s 6d.

It was agreed to fully preserve the earnings of workers transferred from three-shift to two-shift working and for two-shift working to day work for a period of one month for each full year of service, up to a total of 12 years. Thereafter half of the difference will be paid for a similar period and a quarter of the difference for a further similar period.

Ideal Home Exhibition

The 1962 *Daily Mail* Ideal Home Exhibition will be held at Olympia from 6th to 31st March.

Export Co-operation by B.E.A.M.A. Firms

AT a reception in London on Tuesday to mark the publication of the "B.E.A.M.A. Directory," Mr. Leonard H. Short, chairman of the Association's export panel, announced that B.E.A.M.A. were planning a large exhibit in co-operation with the Board of Trade in the British Pavilion at the International Trade Fair to be held at Lagos, Nigeria, next year. The exhibition will coincide with an African conference on the problems of transmitting electricity over long distances.

Mr. Short also said that the domestic electrical appliance section of the industry would stage its biggest-ever display in Europe at the International Household Goods and Hardware Fair in Cologne next February. The B.E.A.M.A. had also embarked on a series of study groups in which manufacturers combined to make a special study of particular markets. Some firms were also pooling overseas facilities in order to spread the high costs of technical representation and to encourage more firms to explore markets which were at present marginal.

The first copy of the Association's new directory of manufacturers and buyers' guide was presented by Mr. Short to Sir Keith Joseph, the Minister of State, Board of Trade. The directory lists more than 1,000 electrical and allied products made in Britain and 15,000 copies are being distributed to buyers throughout the world. There are reference sections in German, Spanish, French, Portuguese and Russian and an introduction outlines the growth and progress of the industry. The B.E.A.M.A.'s Golden Jubilee is recorded in a series of short articles contrasting conditions in the electrical industry in 1911 and 1961. The directory costs £3.

E.T.U. Rule Changes

The Rules Revision Conference of the Electrical Trades Union opened at Hastings on Tuesday afternoon last week, following the rejection of the High Court application by Mr. Frank Chapple for an injunction restraining the Union from holding the conference.

A proposal by the Executive Council for amendments to the rules governing balloting was approved. Under the new system the handling of ballots is to be taken out of the hands of head office and branch secretaries and will be dealt with by a firm of chartered accountants. Mr. Frank Foulkes, general president of the Union, said that this had been done in the light of the judgment of Mr. Justice Winn and was designed to safeguard officials.

By another decision, the supreme authority of the Union is to be transferred from the Executive Council to the annual delegate meeting.

Contract Price Formulae

THE British Electrical and Allied Manufacturers' Association has issued the figures for its contract price adjustment formulæ. The rate of pay for adult male labour effective since 26th December is deemed to be 213s 6d. The "costs of materials" figures are: For electrical machinery and equipment the Board of Trade index figures published on 17th November are 184·1 (1949=100) and 118·7 (1954=100); both figures are provisional. For turbo-generating and allied plant: Materials used in mechanical engineering industries 192·9 (1949=100) and 128·4 (1954=100); both figures are provisional. Blast furnaces and iron and steel melting and rolling (1948 S.I.C. Ref. 40/41) 191·5 (1949=100) and other steel goods, excluding tubes (1958 S.I.C.), 130·5 (1954=100). The price of ¾in o/d 18 s.w.g. brass condenser tubes (*Metal Bulletin*, 17th November) was 49⅜d/lb.

CAREER FILM

Young men contemplating becoming engineers should gain a good idea of what is involved in the way of education and training from a film produced by the I.C.I. Film Unit bearing the title "Eye to the Future." The film begins with a series of shots graphically conveying impressions of the wide scope of engineering in various industrial fields with, naturally, some emphasis on the chemical branch. Then, rather breathlessly, it presents the life of an engineering student at Cambridge up to the time of graduation. While it is shown that there is a great amount of intensive work, including vacation courses in industrial establishments, it also pays attention to the essential social and recreational aspects of university life.

Copies (16 mm) of the film, which is in colour and runs for nearly half an hour, can be borrowed from the I.C.I. Film Library, Imperial Chemical House, Millbank, London, S.W.1.

Transmitters for Sweden

The Royal Board of Swedish Telecommunications has placed an order with Marconi's Wireless Telegraph Co., Ltd., for 21 vision transmitters, 21 sound transmitters, 40 frequency-modulated sound transmitters and a quantity of programme input, paralleling, feeder and ancillary equipment.

S.T.C. IN NORTHERN IRELAND

IT is announced that a factory is to be built by Standard Telephones & Cables, Ltd., for the manufacture of telephones and telephone exchange equipment at Monkstown, about eight miles from Belfast. Under the auspices of the Northern Ireland Government's scheme to aid employment, the company plans to occupy immediately an existing new building of 50,000 sq ft, to provide facilities for training factory operatives and to start production. The second stage of the project will be to build on an adjacent site of 20 to 30 acres a factory of some 150,000 sq ft which, when in full production, will provide regular employment for approximately 2,000 people. The site is capable of further development.

The new factory will form part of the company's Telephone Switching Division and will supplement the output of that Division's main factory at New Southgate. There is also a manufacturing unit of this Division at Treforest, in South Wales.

European Tariff Reductions

At a meeting of the Ministerial Council of the European Free Trade Association in Geneva last week five countries—Britain, Denmark, Portugal, Sweden and Switzerland—agreed to reduce tariffs between each other by 10 per cent as from 1st March, 1962. Austria and Norway will do the same not later than 1st September, 1962. The dates are an advance on the original target of 1st July, 1963, set in the Stockholm Convention. The acceleration represents a parallel move to the Common Market tariff reduction of 10 per cent to take place on 1st January, 1962.

WINDER FOR AUSTRALIAN COAL MINE

A double-drum, single-clutch, geared d.c. winder is to be manufactured by G.E.C. (Engineering), Ltd., for Oakdale State Coal Mine, Australia. The approximate value of the contract is £A180,000. The winder will be used to raise 500 tons of coal an hour from a vertical mine shaft 1,350ft deep by means of balanced skips, each with a capacity of 8 tons of coal.

Tobago Submarine Power Cable

A CONTRACT valued at approximately £200,000 has been received by British Insulated Callender's Cables, Ltd., from the Trinidad and Tobago Electricity Commission to manufacture and install 24 miles of submarine gas-filled power cable, with terminations and accessories. The cable will provide Tobago with a 33 kV a.c. supply from the transmission system in Trinidad. A three-core cable will be used. The rated load capacity of the circuit will be 12 MW. The manufacture of the cable will be undertaken by British Insulated Callender's (Submarine Cables), Ltd., and it will be installed by British Insulated Callender's Construction Co., Ltd.

The cable will be armoured as one continuous length sufficient for the crossing. Its nominal overall diameter will be 2·86in and its weight in air 26·5 lb/yd. The cable will be laid from Toco Bay, Trinidad, to Milford Bay, Tobago.

HIGH SCOTTISH ELECTRICITY OUTPUT

THE October returns of electricity sent out by Boards for their consumers show that the highest gains were once more in Scotland, particularly in the South where the rise of 14·3 per cent brought the average for the twelve months up to 12·8 per cent. In England and Wales the highest rate was the 8·2 per cent of the North Western Area. Four Boards —London, Southern, Midlands and South Wales—recorded falls in sales. The Electricity Council states that if the actual average increase of 4·6 per cent for Area Boards in England and Wales is corrected for weather conditions and working days, the rate would be equivalent to 5·4 per cent. Another factor which should be taken into account is the extension of "summer time" by three weeks this year, affecting the lighting load.

ELECTRICITY GENERATED AND SENT OUT FOR PUBLIC SUPPLY

	Fuel consumed Thousand tons			kWh generated Millions			kWh sent out Millions	Output capacity MW
	Coal	Coke and Breeze	Oil	Steam	Water power	Total		
Central Electricity G.B.	4,378	70·2	432·3	10,087	12	10,106	9,491	28,170
North of Scotland H.E.B.	—	—	1·3	—	305	310	310	1,045
South of Scotland E.B.	292	0·3	1·0	551	55	606	572	1,804
Total for October, 1961	4,670	70·5	434·6	10,638	372	11,022*	10,373	31,019
Corres. total for October, 1960 ...	4,503	65·0	479·5	10,254	180	10,448	9,834	29,099
Inc. or dec., per cent	+3·7	+8·5	−9·4	+3·7	+107·1	+5·5	+5·5	+6·6
Total to date, 1961	42,432	698	4,363	98,267	2,476	100,876	94,872	
Total for corres. 10 months of 1960 ...	40,080	738	4,245	92,625	1,978	94,722	89,138	
Inc. or dec., per cent	+5·9	−5·4	+2·8	+6·1	+25·2	+6·5	+6·4	

* This figure includes generation by other methods amounting to 12 million kWh.

ELECTRICITY SENT OUT BY BOARDS FOR THEIR CONSUMERS

Board	Totals for October (million kWh)			Twelve Months' Totals Ended 31st October (million kWh)		
	1960	1961	Inc. or Dec. %	1960	1961	Inc. or Dec. %
London	788·2	806·4	+ 2·3	8,783·9	9,310·2	+ 6·0
South Eastern	547·5	567·8	+ 3·7	6,189·1	6,635·8	+ 7·2
Southern	727·1	771·9	+ 6·2	8,233·9	8,954·1	+ 8·7
South Western	337·2	359·0	+ 6·5	3,821·0	4,131·3	+ 8·1
Eastern	882·8	945·2	+ 7·1	9,871·0	10,593·5	+ 7·3
East Midlands*	746·4	776·7	+ 4·1	8,188·3	8,772·7	+ 7·1
Midlands*	985·0	1,015·4	+ 3·1	10,803·8	11,445·3	+ 5·9
South Wales*	528·6	503·9	— 4·7	5,934·1	6,143·8	+ 3·5
Merseyside and N. Wales* ...	573·5	619·0	+ 7·9	6,344·8	6,921·7	+ 9·1
Yorkshire*	978·2	1,035·5	+ 5·9	10,542·9	11,761·6	+11·6
North Eastern*	548·8	570·3	+ 3·9	5,991·1	6,465·3	+ 7·9
North Western*	947·0	1,025·0	+ 8·2	10,488·6	11,480·1	+ 9·5
Total all Area Boards	8,590·3	8,996·1	+ 4·7	95,192·5	102,615·4	+ 7·8
Direct Supplies by C.E.G.B. ...	314·8	315·0	+ 0·1	3,764·6	3,814·2	+ 1·3
Grand Total	8,905·1	9,311·1	+ 4·6	98,957·1	106,429·6	+ 7·6
Mainly Industrial Areas*	5.307·5	5,545·8	+ 4·5	58,293·6	62,990·5	+ 8·1
Mainly Non-Industrial Areas ...	3,282·8	3,450·3	+ 5·1	36,898·9	39,624·9	+ 7·4
South of Scotland E.B.	700 0	799·4	+14·3	7,795·8	8,790·3	+12·8
North of Scotland H.E.B. ...	156·0	172·3	+10·4	1,770·0	1,971·1	+11·4

* Those in which industrial consumers took over 50% of the total sales in the preceding financial year.

Vertical fluorescent lanterns on one of the five central refuges in Fleet Street. In the background is one of the original gas lamps

New Lighting for Fleet Street

After being lighted by high pressure gas for 50 years, Fleet Street, London, has now had fluorescent lighting installed. The London Electricity Board is installing some of the lanterns on the refuges in the road centre, and others on the walls of buildings. There are 27 specially designed wall lanterns each housing three 80 W tubes and on each of the five refuges there are two pairs of lanterns with 5ft 80 W fluorescent lamps arranged vertically.

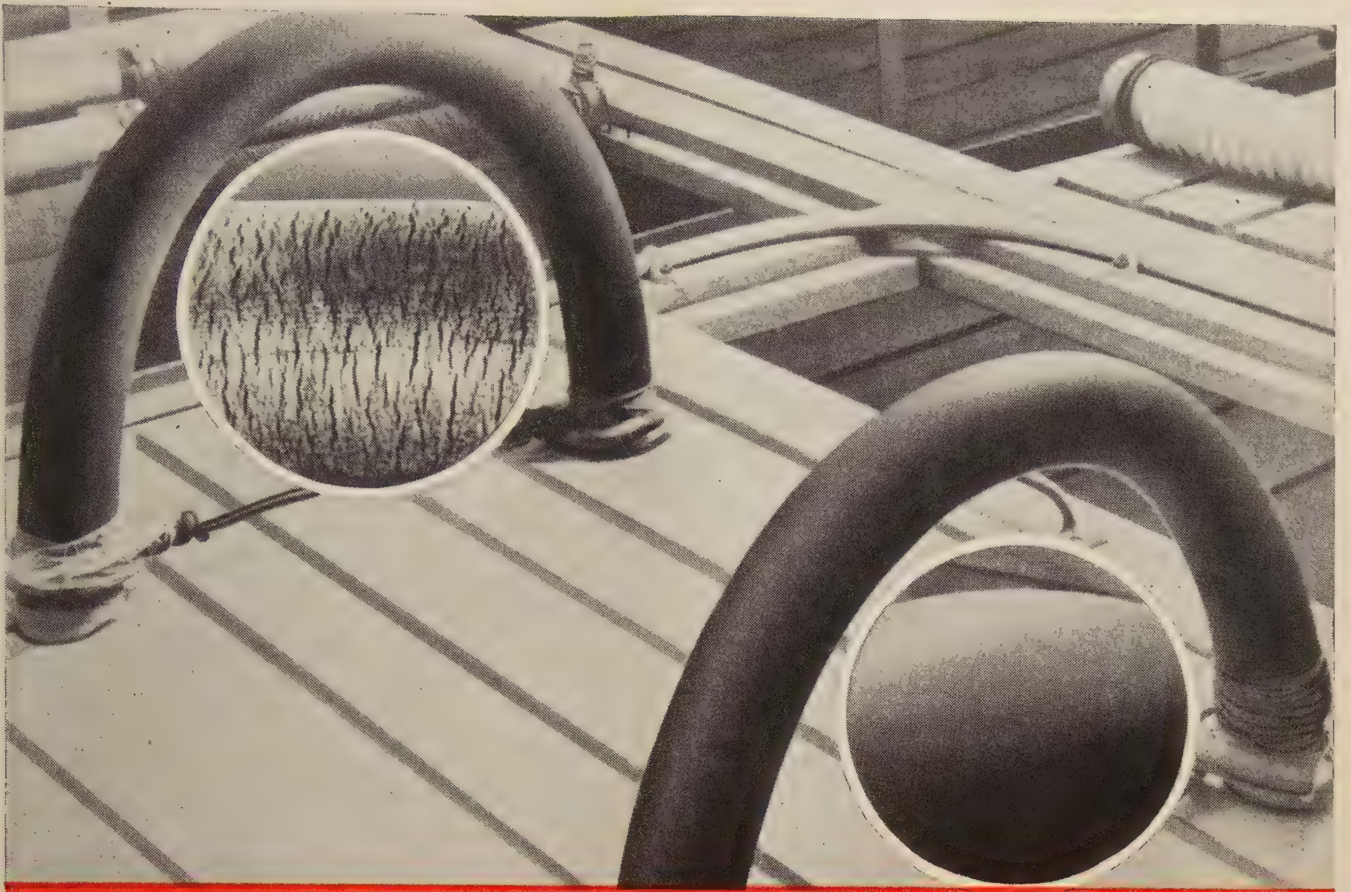
BOWTHORPE FORM NEW COMPANY

Under an agreement between Bowthorpe Holdings, Ltd., and the Deutsch Company of Banning, California, a new jointly owned company, Hellermann Deutsch, Ltd., is to be formed in which Bowthorpe Holdings will have a 51 per cent interest.

Hellermann Deutsch will manufacture and market Deutsch connectors for electrical conductors and other products, and the range of connectors and ancillary equipment at present being produced and marketed by Hellermann, Ltd. Deutsch connectors cover the standard miniature and subminiature ranges.

A new factory for Hellermann Deutsch, at East Grinstead, Sussex, is planned to be completed during 1962. Production of Deutsch connectors will commence in the United Kingdom early next year.

Inquiries regarding Hellermann and Deutsch connectors should be made to Hellermann Deutsch, Ltd., Gatwick Road, Crawley, Sussex.



CABLE JACKET OF DU PONT NEOPRENE IS STILL TOUGH AND LIVELY AFTER 24 YEARS

These photographs show test cables that have been fixed in a bent position under stress to increase their vulnerability to surface cracking. This exposure to outdoor wear over a period of 24 years proves the outstanding durability of Du Pont neoprene. See how the natural rubber jacket on the left has been cracked and weakened by the weather. The jacket made from Du Pont neoprene on the right, however, is still lively, resilient and tough.

Du Pont neoprene combines many properties that make it far superior to other jacketing materials. It has remarkable heat and flame resistance. It has excellent properties over a wide temperature range and can be compounded to remain flexible at –65° F, at the other extreme it has proved serviceable even upon brief, intermittent exposure to 500° F. Du Pont neoprene gives increased safety, too, because it will not propagate flame and it helps cut down the danger of fires.

Du Pont neoprene, in fact, offers balanced resistance to all the causes of deterioration—weather, sunlight and ageing; flame and ozone; oil and grease; many organic and inorganic chemicals; soil acids and galvanic action . . . as well as severe impact, abrasion and cutting. Ask your supplier about wire and cable jacketing made from Du Pont neoprene, and send the coupon below for a free copy of "What neoprene is—and how it protects wire and cable."

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(United Kingdom) Ltd.
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ELECTRICAL REVIEW 12/61

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Please send copy of "What neoprene is—and how it protects wire and cable." *I am particularly interested in*........................
....

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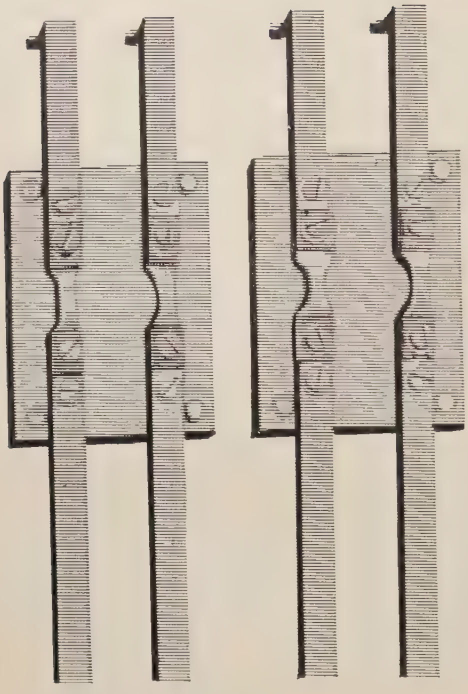

STOTZ MINIATURE CIRCUIT BREAKERS

12,000 A

1895 Fuse links. 1961 miniature circuit breakers with a short circuit capacity of 12,000 amps at 220V (power factor 0.6) plus a mechanical life of over 20,000 switching operations. These are just two of the outstanding features of the new S201.

Over 35 years' experience in design and manufacture of miniature circuit breakers has gone into producing a completely new range for the protection of lighting and power circuits.

1 pole, 2 pole and 3 pole designs with neutral link and/or auxiliary switches are now available.

Other STOTZ products:—

CONTACTORS - RELAYS - MICRO SWITCHES
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Proposals for Hire-Purchase Reform

THE Consumer Advisory Council has sent to the Finance Houses Association proposals for the reform of hire-purchase law. Among its recommendations are that there should be a standard form of contract in legible type accompanied by a simply-worded précis and that a standard form of record card should be issued with it. The contract should state the total h.p. price as well as the cash price and give the true interest rate. Both parties should be given a 48-hour " escape " period.

A minimum deposit of 10 per cent is recommended for domestic appliances (25 per cent for cars) and they suggest that all firms offering h.p. facilities should be registered with the Board of Trade. They believe that the hirer-financier-retailer relationship needs restating and the offering by finance houses of a commission to retailers is deplored because " pressure is brought to bear on purchasers to buy on h.p. rather than by cash although the latter is to the purchaser's advantage." They would also like to see an extension of the practice of allowing a rebate when the h.p. debt is cleared early.

Some of these proposals are, it is understood, to be included in a Bill to be introduced by Mr. L. T. Williams (Lab., Warrington), who obtained first place in the Commons' ballot for Private Members' Bills. Mr. Philip Goodhart (Cons., Beckenham), who was second in the ballot, is also to bring in a consumer protection Bill dealing with guarantees.

Domestic Heating Exhibition

The Eastern Electricity Board's domestic heating exhibition, designed to show the versatility and flexibility of electricity in providing central heating or whole house warming, opened at the Bedford Corn Exchange, for three days in the middle of November and attracted considerable attention. Designed by the Board's own staff, the exhibition is centred around the lounge, bedroom, dining room and kitchen. While the emphasis is naturally on storage heating, either by floor warming or by block heaters, the advantages of the radiant and convector fire in providing immediate warmth with a complete absence of dirt and trouble, are skilfully driven home. The Eastern Board's film on floor warming was shown at intervals and there was also a demonstration of the laying of the cables in a typical floor warming installation.

Playground Floodlighting

As part of the London County Council's scheme for improving social and recreative facilities for young people, nineteen school playgrounds are to be floodlit at a cost of £21,620.

Diesel-Electric Locomotives for British Railways

The British Transport Commission has ordered another 27 main line diesel-electric locomotives (Type 2, 1,365 h.p.) from the Brush Electrical Engineering Co., Ltd., and 57 power equipments incorporating 1,250 h.p. Sulzer diesel engines from Associated Electrical Industries, Ltd. The value of these orders is nearly £5 million.

F.B.I. REGISTER 1962

THE " F.B.I. Register of British Manufacturers 1962 " has been published for the Federation of British Industries by Kelly's Directories, Ltd., and Iliffe Books, Ltd., Dorset House, Stamford Street, London, S.E.1, price 50s. In a foreword to this, the 34th edition of the Register, Mr. C. E. Harrison, president of the Federation of British Industries, says, " British industry produces goods of unsurpassed technical quality and its long exporting experience gives it a professional knowledge of market needs. This of itself is not enough; Britain must let the world know what she has to sell and this Register helps serve that purpose. The constant stream of inquiries received by the Federation shows how much the Register is appreciated and used throughout the world."

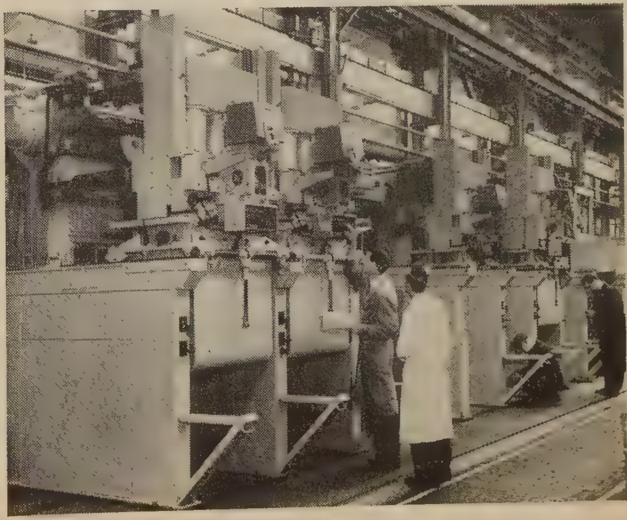
The Register (1,174 pp.) is a comprehensive and accurate guide to a substantial cross-section of British industry and contains lists of the products and services of over 8,000 member firms under more than 5,500 alphabetical headings. In addition to the classified buyers' guide there are seven other sections, giving addresses of companies and firms, and information about trade associations, proprietary names, trade marks, etc. The French, German and Spanish glossaries give translations of every product term used in the main buyers' guide, each being numbered for easy reference between the English headings and their translations.

LARGE BOILERS FOR AUSTRALIA

Two 350 MW reheat boiler units are to be supplied by International Combustion Australia, Ltd., for the new Munmorah power station of the New South Wales Electricity Commission. The total value of the order is about £A10 million.

The boilers will be pulverised-coal-fired and designed for assisted circulation with the following advanced operating conditions:—Evaporative capacity, 2,450 klb/hr; steam pressure, 2,400 p.s.i.; superheater outlet temperature, 1,055°F; and reheat temperature, 1,005°F. As already announced, the contract for two reheat turbo-generators for the station has been awarded to the English Electric Co.

New Zealand's First Steelworks



This switchboard, undergoing a final check at the Stafford Works of the English Electric Co., Ltd., is part of a comprehensive contract the company has for the electrical equipment in New Zealand's first steelworks. The 22in billet and bar mill and melting shop, owned by Pacific Steel, Ltd., of Auckland, will go into operation next year. Initially production will be of reinforcing bars for civil engineering use. The four-panel single busbar switchboard, rated at 22 kV at 750 MVA, can be extended by the addition of further switch units

Water-Activated Battery Developments

NEW applications of their water activated batteries were demonstrated in London last week by the McMurdo Instrument Co., Ltd. These batteries were developed shortly after the war and consist of a polythene case containing silver chloride and magnesium, silver chloride and zinc, cuprous chloride and zinc, or magnesium plates which form the poles of an electrolytic cell when immersed in salt water. A chemical coating or the addition of a salt pellet in the container enables them to work in fresh water. The cell will work in temperatures from −40°C up to more than 100°C and since it contains no electrolyte initially, it has an unlimited shelf life before immersion.

An "Aqualite" for use with meteorological balloons to determine wind direction and velocity at night has been tracked by telescope to a height of 40,000ft over a range of 18 miles. The battery, which has an absorbent fabric between its plates, is activated by being dipped in water before release and has a muff to prevent the water freezing at high altitudes. Its total weight on release is only 26 grammes. Buoyant versions capable of feeding lamps with outputs of 200 lumens for 45 min are used by ocean weather ships in laying emergency flare paths for ditching aircraft.

Silver chloride/magnesium "Aquacels" produce a maximum voltage of 1·5 V. They can activate alarm signals and provide emergency lighting (even when totally submerged) in mine galleries where there is a risk of flooding, while underwater swimmers can be equipped with 4 W working lights and 13·5 W glove warmers.

The company has also produced a new range of xenon tube flashing beacons, operated by automatic transistorised switching units from standard "Aquacels" or dry batteries, to give luminosities of up to one million peak lumens for ten hours or more.

High voltage batteries with outputs of up to 300 A are considered feasible, and a 150 V battery to provide 25 mA for the continuous automatic transmission of radio distress signals from liferafts for four days is being developed.

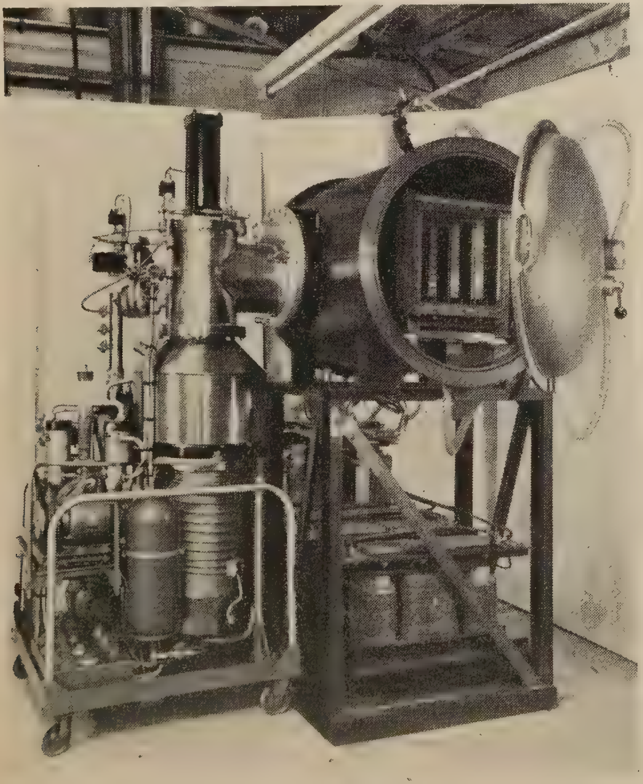
Water-activated radiosonde batteries for meteorological balloons with outputs of a few milliamps at 90 and 150 V consist of very thin plates with absorbent fabric between them, arranged in circular chains inside a light container. The whole assembly weighs only a few ounces and holds less than an ounce of absorbed water on release.

HIGH VACUUM BRAZING FURNACE

A RESISTANCE heated high vacuum brazing furnace has recently been built by Vacuum Research (Cambridge), Ltd., for Services Electronics Research Laboratory, Baldock. An auto/manually controlled electric resistance heated hot zone measures 11in high by 12in wide by 24in long, the maximum operating temperature being 1,300°C. The charge weight at this temperature is 20 lb evenly distributed along the hearth. At the lower temperature of 1,100°C the maximum charge weight is increased to 80 lb.

The furnace heater consists of tungsten elements supported by a framework of molybdenum struts and rods. This is surrounded by layers of electro-polished molybdenum and stainless steel radiation shields to prevent heat losses. The heater is mounted in a horizontal stainless steel water cooled chamber. The maximum consumption is 46 kVA at 415 V 50 c/s. The furnace unit is fed by a three-phase delta wound transformer at 44·5 V and power control is by a signal fed from a thermocouple via a temperature controller to a magnetic amplifier and saturable reactor.

The high vacuum pumping system enables a vacuum better than 10^{-5} mm Hg to be obtained. A pumping speed of better than 300 litre/sec is available.



Interior of high vacuum brazing furnace (Vacuum Research (Cambridge), Ltd.)

Export Trade Volume

The Board of Trade volume index of electrical exports for the third quarter of 1961 was 121 compared with 147 in the previous quarter and 118 in the third quarter of last year. The third quarter figure for non-electrical machinery was 135 compared with 120 a year earlier. Against the general trend there has been a steady increase in the volume of electrical imports, the indices being 241 in the third quarter of 1960, 272 in the second quarter of this year and 293 in the third quarter. The price index for exports of engineering products is, at 122, two points higher than in the third quarter of 1960.

NON-DESTRUCTIVE TESTING

The paper on "Xero-radiography Applied to the Inspection of Electrical Equipment" presented at the I.E.E. Conference on Non-Destructive Testing was by A. Nemet, D.Sc. (not Nement as given in last week's issue), A. W. Balls, B.Sc., and W. F. Cox, B.Sc. Dr. Nemet is technical consultant to the Industrial Division of Watson & Sons (Electro-Medical), Ltd.

Heater Price Reduction

The list price of the G.E.C. HO 6321 2¼ kW "Nightstor" heater has been reduced to £19 15s plus £4 10s purchase tax.

NEW A.E.I.-G.E.C. GLASS COMPANY FORMED

A new company has been registered by the A.E.I. Lamp & Lighting Co., Ltd., and the General Electric Co., Ltd., to take over their glass manufacture and glass sales not already covered by the jointly owned Glass Bulbs, Ltd. The new company will be known as Glass Tubes & Components, Ltd., with an issued capital of £2½ million, to be held in equal parts by the two parent companies, and it will commence trading in the New Year.

The announcement states that the incorporation of the new company is in line with past policy. In 1946 Glass Bulbs, Ltd., was formed to put the manufacture of glass bulbs for the popular sizes of lamps on a more economical basis.

TRADE ANNOUNCEMENTS

From 18th December the Swansea branch office of **Brook Motors, Ltd.**, will be at Orchard House, Orchard Street, Swansea (telephone: Swansea 50297).

Dron & Dickson, Ltd., of Glasgow, technical representatives for lighting and signalling equipment manufactured by Heyes & Co., Ltd., have appointed Mr. John A. Reid as their representative in the Border Counties including Northumberland, Durham and Tees-Side. His address is Park Cottage, Newborough, Hexham, Northumberland.

Electric Construction Co., Ltd.—Mr. Norman R. Wheldon has been appointed northern areas manager for Scotland and the areas at present covered by the company's Leeds and Newcastle-on-Tyne offices, with effect from 1st January. He will be based at Bushbury House, 4, Laurel Mount, St. Mary's Road, Leeds, 7. Mr. Dennis Crotch, who has assisted Mr. Wheldon at Glasgow for the past three years, becomes manager of the Glasgow office.

Mr. R. Morgan has been appointed Eastern Counties agent for **Gatehill Beco, Ltd.** He will also cover Oxfordshire and Northamptonshire.

In addition to full after-sales service for all measuring instruments of their own manufacture, **Measuring Instruments (Pullin), Ltd.**, have expanded their repair service to cover other manufacturers' products. A new department, managed by Mr. A. V. Morris, has been set up at 73, Avenue Road, Acton, W.3, close to the main factory.

Parliamentary Report

Prime Minister Rebukes Electricity Council

Concerned at the breach in the Government's pay pause policy brought about by the wage settlement in the electricity supply industry, the Prime Minister made a personal statement in the House of Commons last week rebuking the Electricity Council. Mr. Macmillan said that the decision rested entirely with the Electricity Council, but the Government had left the Council under no doubt as to the importance which they attached to the pay pause. They did not regard this settlement as being consistent with that policy. When the Minister of Power was informed that a final offer was about to be made he expressed great disquiet and anxiety and emphasised the damage that a settlement in the terms proposed would do. Mr. Macmillan then renewed the plea for all employers to respect the need for the pay pause. He urged restraint in wages, salaries and dividends.

Mr. Gaitskell asked Mr. Macmillan if it would not have been fairer to have presented the Council's point of view in his statement to Parliament. What steps did he intend to take about the decision?

Mr. Macmillan said that the Government had no statutory power to settle the wages of any except their direct employees.

Mr. Nabarro pointed out that claims were pending from the railwaymen and coalminers and he asked what steps the Government intended to prevent a repetition of the breach of the pay pause. Mr. Macmillan said the Government must rely on those who managed the industries to carry out what they thought was right.

Mr. Lee asked if the Prime Minister realised the great damage being done to an industry, such as the electricity supply industry, where wages were earnings—where to get any advance in pay the men must leave this type of industry and go where the earnings were higher than wages.

Mr. Macmillan said he did not understand that there was any grave problem in the electricity industry. It was carrying on effectively.

Diesel Trains

In response to a question from Mr. Hector Hughes, Mr. Ernest Marples, the Minister of Transport, said that dieselisation of the Scottish railway services was proceeding very rapidly. The whole of the east coast route from King's Cross was being modernised by diesels. Some were already operating between Euston and Crewe and an experimental diesel service was in operation between Glasgow, Aberdeen and Oban.

Meter Disputes

The Minister of Power received 239 applications during 1960 and the first six months of 1961 for the determination by independent meter examiners of disputes resulting from consumers' complaints concerning the accuracy of meters supplied by Electricity Boards, stated Mr. George, Parliamentary Secretary to the Ministry of Power.

Dr. Donald Johnson urged that wider publicity should be given to this. He said that he had had many complaints about meters from constituents who had not known that the right of appeal existed.

Mr. George said there were standing instructions that consumers should be told if they disputed the accuracy of their meters of their right to have a meter determination. Boards were often able to settle cases satisfactorily without resort to determination.

Civil Development Contracts

Viscount Hailsham, the Minister of Science, replying to a debate in the House of Lords on the need for greater emphasis on research in industry, said that the Department of Scientific and Industrial Research had been considering the use of civil development contracts to complement the work of the National Research Development Corporation in support of science-based development in industry. It had now received authority to proceed with two major projects.

Viscount Caldecote, who opened the debate, said there was inadequate collaboration between universities and industry. He was also afraid there was some duplication of research and development in the nationalised industries like transport, electricity and gas which should surely concentrate on operational research.

The Earl of Halsbury stressed the need for scientifically trained salesmen and administrators in business.

NEW ELECTRICAL EQUIPMENT

CONTAINER LEVEL INDICATOR

The "Quantimeter" equipment announced by LANCASHIRE DYNAMO ELECTRONIC PRODUCTS, LTD., Rugeley, Staffs., is designed to provide a continuous indication of the level of stored material either at the container or, alternatively, at a remote control data recording point. The unit operates on the change of electrical capacitance as material builds up along a length of wire electrode installed in the container. The change is measured within the equipment and displayed on an indicating instrument which may be calibrated in any appropriate units. A feature is the inherent compensation against indicational errors caused by variations in the moisture content of the materials. The indication is linear from zero to maximum, and six capacitance ranges are provided to ensure that the equipment can be used in a wide variety of materials.

CERAMIC R.F. HEATING TRIODE

A power triode for industrial r.f. heating applications having a ceramic envelope which permits operation at higher frequencies than are possible with similar valves having glass envelopes is announced by STANDARD TELEPHONES & CABLES, LTD., Connaught House, Aldwych, London, W.C.2. The first valve of this type is known as the 3RC/223E and is a near equivalent of the established 3J-Q-R-Z/222E valves which operate from a 6,000 V supply and develop up to 24 kW of output power. Whereas the anode voltage of the glass versions must be lowered for operation at frequencies above 50 Mc/s, the ceramic valves may be operated at full rated voltage at up to 100 Mc/s. The new valves have a shorter coaxial stem and a cathode with a greater emission reserve. The valve is available in forced-air-cooled, vapour-cooled and water-cooled versions.

SMOKE CONTROL EQUIPMENT

The range of smoke control units designed by PHOTRONIC CONTROLS, LTD., The Lodge, Randalls Road, Leatherhead, Surrey, comprises two basic units. The smoke alarm type SA provides a visual and audible warning when smoke exceeds a pre-set density, and utilises a light beam projected across the flue or chimney on to a photo-electric cell. The type used is capable of withstanding ambient temperatures up to 70°C. No special cables are required, the cell is not "polarity conscious" and there is no limit regarding wiring runs between the control unit and photocell. Units are available for any size of installation from a few inches to 40ft diameter. This unit is priced at £25.

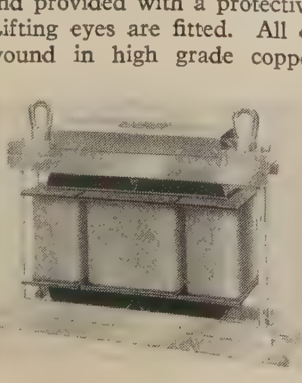
The type SI unit is basically similar but has in addition a 10in indicating meter on which the smoke density is shown continuously. The price of this unit is £50. A bell muting switch and a variety of recorders are also available to work in conjunction with these units.

SATURABLE REACTORS

The range of "C" core saturable reactors announced by ELECTRO METHODS, LTD., Industrial Control Division, Caxton Way, Stevenage, Herts., is suitable for controlling electric heaters and furnaces and can be incorporated in automatic control schemes. Three-phase loads may be handled by using three single-phase units.

The reactors consist of specially wound a.c. and d.c. bobbins through the centre of which pass high grade strip wound "C" cores to form a three limb construction. This assembly is clamped by aluminium alloy channel and tie rods to form a rigid structure. Terminal blocks for all electrical connections are fitted to the top channel and provided with a protective cover. Lifting eyes are fitted. All coils are wound in high grade copper, fully cotton taped and are varnish impregnated.

Some variation in the maximum output voltage may occur between units but the output will never be less than 215 V on a 240 V supply when connected to the correct load resistance. By using three signal windings in series a control signal of between 165 and 180 V d.c. is required. The fourth signal winding is then available for biasing purposes. Signal windings can be parallel or series connected to suit the application but the control current in any winding should not exceed the rated value by more than 50 per cent. Where less than the total number of windings is used the control current in the remaining windings must be increased proportionately. Units with outputs of 1, 2, 3, 4 and 5 kVA are now available, suitable for connection to 220/250 V or 110/120 V 50 c/s supplies and requiring control powers between 16 and 23 W. Reactors from 6 to 12 kVA will be produced shortly.

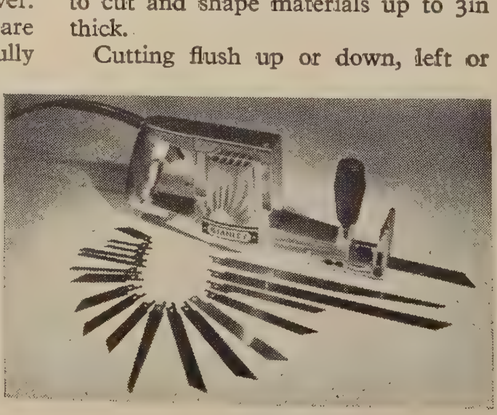


Electro Methods "C" core saturable reactor

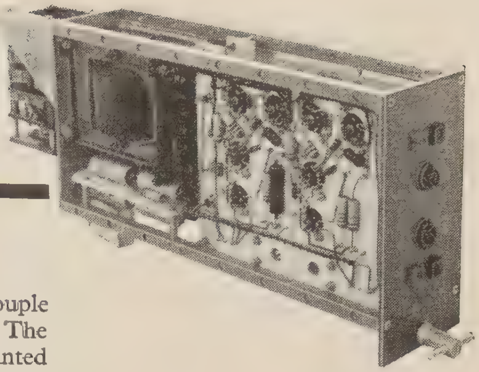
RECIPROCATING POWER SAW

The heavy duty No. 363 two speed, reciprocating power saw announced by STANLEY WORKS (G.B.), LTD., Rutland Road, Sheffield, 3, has a length of only 14½in and can be operated comfortably between joists of 16in centres. The weight is 8 lb. The saw can run at a speed of 3,000 strokes/min to cut wood up to 3in thick, plaster board or composition materials, or at 2,200 strokes/min for cutting metals, plastics, pipe, conduit and similar materials. It can be converted into a jig saw able to cut and shape materials up to 3in thick.

Cutting flush up or down, left or



Stanley reciprocating saw

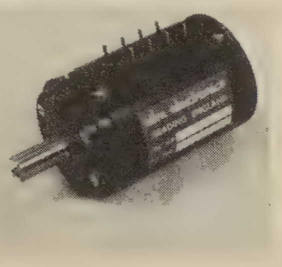


Experitron stabilised power unit

right, without additional attachments is possible, and the saw will operate in any cutting position as the blade can be mounted in six different positions. The auxiliary handle at the front of the tool is adjustable to five holding positions for multi-directional cutting. Universal motors are incorporated, suitable for operation from d.c. or 50 or 60 c/s supplies at 230 or 115 V. The current consumption at 230 V is 2·4 and 1·6 A at the high and low speeds respectively. The brush holders permit visual check on brush life. The tool is priced at £53 10s with five blades or £56 10s with eight blades and a metal carrying case.

SLIP-RING ASSEMBLIES

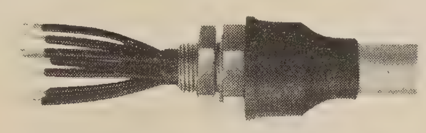
The first of a standard range of precision slip-ring assemblies designed specifically for strain gauge, thermocouple and other instrument applications that require a small unit giving low frictional torque, low electrical noise and long life is announced by I.D.M. ELECTRONICS, LTD., Whitley Kiln, Basingstoke Road, Reading, Berks. By using small diameter electrodeposited silver rings and silver graphite brushes, electrical noise levels of less than 3 μV/mA peak to peak are achieved at speeds up to 3,000 r.p.m. The life of the unit is in excess of 1,000 hr at 3,000 r.p.m., after which time it may be returned for servicing. The maximum recommended speed is 10,000 r.p.m. Contact resistance is 0·07 Ω per circuit including leads, and insulation resistance between circuits is better than 200 MΩ at 500 V d.c. The slip ring, which has a shaft diameter of 0·3125in, is mounted in a 1·5in diameter synchro type housing, and the overall length is 3¼in. Eight- and twelve-way versions are also available. Assemblies with a marker ring for counting purposes, or with special leadwires for critical thermo-couple applications are also available. The assemblies may be cantilever mounted from the end of a shaft, with a simple torque arm preventing rotation of the housing, or, for high-speed applications, clamped rigidly to a base plate and the shaft driven through a flexible coupling.



Left: I.D.M. Electronics 8-way slip-ring assembly

ADJUSTABLE CABLE GLAND

The adjustable cable gland manufactured by CABLE COVERS, LTD., St. Stephen's House, Westminster, S.W.1, has been developed for use with p.v.c. insulated cables and is suitable for use with all s.w.a. cables. The feature of adjustability enables the gland to accept many of the unavoidable variables encountered in cable dimensions and accidental inaccuracies that occur in the preparation of the cable end. In addition, this feature ensures full thread engagement between the gland components, irrespective of any changes in the diameter of the armouring wire. Each gland size will centre in two sizes of "knock-out" hole. A small range of seven physical sizes covers cable sizes from 3×·029 (0·002 sq in) up to 61×·103 (0·5 sq in) in a range of voltages from 250 to 3,300 V.



Cable Covers adjustable cable gland

STABILISED POWER UNIT

A stabilised power unit with two separate and independent 300 V d.c. outputs, operating from a 200/240 V, 50 c/s, single-phase input, is now being marketed by EXPERITRON, 165, Young Street, Sheffield, 1. The maximum current available from each output is 200 mA.

The output is stabilised to ±0·2 per cent from zero to full load with an input voltage fluctuation of up to ±5 per cent. The maximum ripple of the stabilised d.c. output is 15 mV. There is a preset voltage control at each output. Five units can be assembled in a standard 19in rack mounting. Each unit measures 6in high by 3½in wide by 15½in deep.

Voltage and current monitoring sockets are provided and meters can be fitted as extras. The unit can also be supplied with a variable voltage swing of 200 to 300 V at each output. The price of the basic unit is £60.

HIGH CURRENT TRANSISTORS

A series of high current, high power, p-n-p alloy-junction germanium transistors has been produced by NEWMARKET TRANSISTORS, LTD., Exning Road, Newmarket, Suffolk. They are designed for amplification, control and switching applications. The NKT 501-504 range comprises four types with current ratings up to 25 A, a guaranteed minimum current gain of 12 at the maximum rated collector current, high power rating and voltage ratings of 60 V and 30 V. The low saturation voltage results in low self-dissipation when used for switching applications. The drive voltage for peak collector current is low and distortion is minimised by controlled beta fall off. All units are cold welded for reliability; stringent surface treatment and high temperature ageing ensure parameter stability.

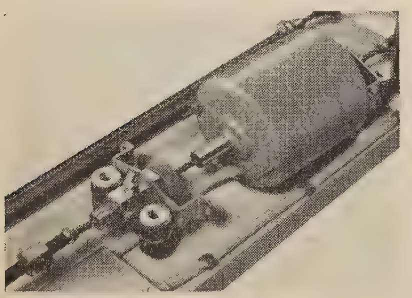
ELECTRICALLY OPERATED CURTAIN TRACK

THOMAS FRENCH & SONS, LTD., Chester Road, Manchester, 15, manufacturers of the well-known "Rufflette" curtain suspension systems, have now added an electrically operated curtain track to their range. The system is designed to open and close curtains by means of an electric motor operated from a normal mains voltage supply, controlled by a push-button. In operation the motor drives a flexible spirally formed cable which carries the suspension and master runners on which the curtain is hung.

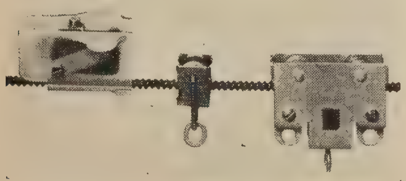
The cable runs through a hollow spindle in the motor and through a driving nut threaded to conform to the spiral of the cable so that, as the nut rotates the cable acts as a lead screw and moves laterally through the motor either way depending on the direction of motor rotation. Master runners are attached to the cable and the leading edges of the curtains are fastened to the master runners; thus the rotation of the motor operating the cable will open or close the curtains.

The length of travel of the cable is controlled by limit switches which automatically stop the motor when the master runners are in the required position.

The entire mechanism is carried on an appropriately dimensioned headboard, which is usually mounted under the lintel or ceiling, or in such a position that it forms part of a pelmet fixture. The recommended maximum weight of curtains to be operated by one motor is 66 lb.



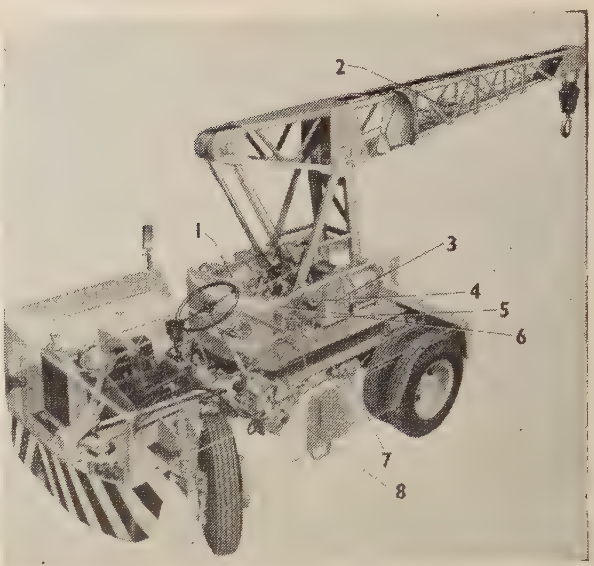
Thomas French & Sons electrically operated curtain track. The motor unit, opened to show the flexible cable passing through the hollow spindle to which the driving nut is attached, is shown above and (below) the master runner, suspension runner and limit switch on the flexible cable are illustrated



LIGHTING FITTINGS

New tungsten lamp fittings including lipped, screw neck, angled screw neck and monkscap spheres have been introduced by the STEARN ELECTRIC CO., LTD., 31/33, Vauxhall Bridge Road, London, S.W.1. All are available for tube or chain suspension supported by chromium plated or bakelite galleries. The spheres, in sizes from 6in to 12in in diameter, are of 3-ply opal glass. The company is also producing a range of invisible gallery mushroom fittings of 3-ply opal glass. An illustrated price list giving details of wattages, etc., is available from the manufacturers.

DIESEL-ELECTRIC CRANE



Coles "Leda" crane

(1) Variable voltage 10 h.p. hoist motor. (2) Safe load indicator. (3) Electrical contactor gear. (4) Electro-mechanical brakes. (5) Limit switches. (6) Derrick unit. (7) Slew unit. (8) Totally enclosed slew motor

A NEW fast-travelling, full-circle slewing, low-priced, mobile crane of four tons lifting capacity has been produced by Steels Engineering Products, Ltd. This Coles "Leda" crane has a four-cylinder 3·61 litre engine which powers a mechanical travel transmission in addition to the generator, which is driven by a gearbox power take-off. The generator is a variable speed 0-400 V unit, underslung from the crane chassis.

CATALOGUES AND LISTS

CONTROL SYSTEM.—Brochure on the "Emicon" B.100 machine tool position control system.—**E.M.I. Electronics, Ltd.,** Hayes, Middlesex.

COUNTERS. — Leaflets describing "Elmeco" electromagnetic impulse counters. —**Inglis Knibb & Co.,** 20/21, Tooks Court, London, E.C.4.

INSULATORS.—Catalogue (P.17) containing 39 pages devoted to ceramic insulators produced by the company.—**Geo. Bray & Co., Ltd.,** Leicester Place, Leeds, 2.

MAGNETS.—Descriptive brochure giving information on the various types of "Magnadur" permanent magnets.—**Mullard, Ltd.,** Mullard House, Torrington Place, London, W.C.1.

MAGNETIC SEPARATING DEVICE.—Illustrated leaflet giving details of the "Magnafloat" permanent magnetic device which separates stacked steel sheets automatically.—**Rapid Magnetic, Ltd.,** Lombard Street, Birmingham, 12.

MERCURY SWITCHES.—Catalogue (23 pages) containing full particulars of the company's range of mercury switches.—**I.A.C., Ltd.,** 10, Chase Road, London, N.W.10.

MOTORS.—Illustrated booklet containing particulars of a.c. motors designed to meet difficult site conditions.—**Crompton Parkinson, Ltd.,** Crompton House, Aldwych, London, W.C.2.

OSCILLOSCOPE.—Brochure illustrating and describing a wide-band oscilloscope with a range of plug-in pre-amplifiers.—**E.M.I. Electronics, Ltd.,** Hayes, Middlesex.

POWER SUPPLY UNITS.—Leaflets giving information on regulated power supply units produced by the company.—**Dukes & Briggs Engineering Co., Ltd.,** Approach Road, Urmston, Manchester.

PRECIOUS METALS.—Brochure describing the service offered to industry by the company for precious metal plating for such purposes as contacts in electronic equipment, low voltage plugs and sockets, etc.—**Automatic Telephone & Electric Co., Ltd.,** Strowger Works, Liverpool, 7.

RING MAIN UNIT.—Illustrated brochure (471) describing an 11 kV, 250 MVA ring main unit.—**General Electric Co., Ltd.,** Switchgear Division, Birmingham, 6.

SEMICONDUCTORS.—Leaflet containing information on the company's range of semiconductor devices, including many newly-introduced items.—**General Electric Co., Ltd.,** School Street, Hazel Grove, Stockport, Cheshire.

SEQUENCE TIMER.—Pamphlet dealing with an electronic sequence timer.—**Bruce Peebles & Co., Ltd.,** East Pilton, Edinburgh, 5.

STAFF LOCATION.—Booklet describing the "Herald-a-Phone" system combining staff location, intercom telephones, public address and "music-while-you-work" facilities.—**Associated Electrical Industries, Ltd.,** 3, Avon Trading Estate, London, W.14.

SWITCH LUBRICANT. — Application chart giving information on the methods of using "Electrolube" lubricant.—**Electrolube, Ltd.,** 16, Berkeley Street, London, W.1.

TELEPRINTERS.—Illustrated brochure describing a typical teleprinter installation.—**Creed & Co., Ltd.,** Telegraph House, Croydon.

TEST EQUIPMENT.—Catalogue dealing with the range of microwave and u.h.f. electronic test equipment produced by the Narda Microwave Corporation of America.—**Aveley Electric, Ltd.,** Aveley Industrial Estate, South Ockendon, Essex.

THERMOCOUPLES. — Pamphlet (325) describing the company's range of rare- and base-metal thermocouples for temperatures up to 1,500°C.—**Cambridge Instrument Co., Ltd.,** 13, Grosvenor Place, London, S.W.1.

WATER HEATERS.—Price list covering the company's range of immersion and thermal storage water heaters, lagging jackets, domestic central heating units, etc., and a leaflet on the "Lincoln" water heater.—**Santon, Ltd.,** Somerton Works, Newport, Mon.

WIRING ACCESSORIES.—Leaflet illustrating and describing the "Wylex" switched spur box for connecting fixed appliances to ring main circuits.—**George H. Scholes & Co., Ltd.,** Wythenshawe, Manchester.

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PORTABLE BLOWER

A lightweight machine of proven reliability combining :

★ A Powerful Blast for cleaning dust and grit from machinery.
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★ A Compelling Suction for industrial cleaning, enabling better maintenance . . . . reducing breakdowns and minimising wear.

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INDUSTRIAL VACUUM CLEANER

quiet, efficient, powerful . . . air volume 130 c.f.m. with over 50" water-lift and 3 speed control Pneumatic tyres and swivel castors give it maximum manoeuvrability, and it has a dust capacity of 1½ cu. ft.

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cubicle switchboards

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MULTI-MOTOR STARTER PANELS
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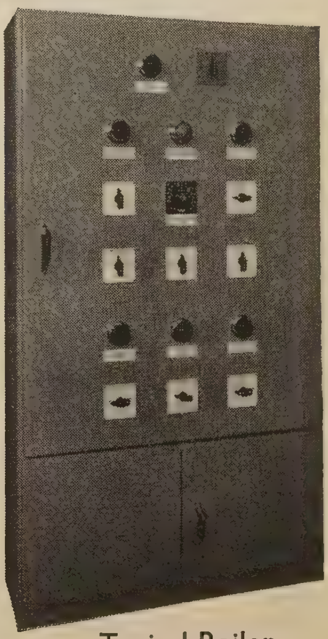

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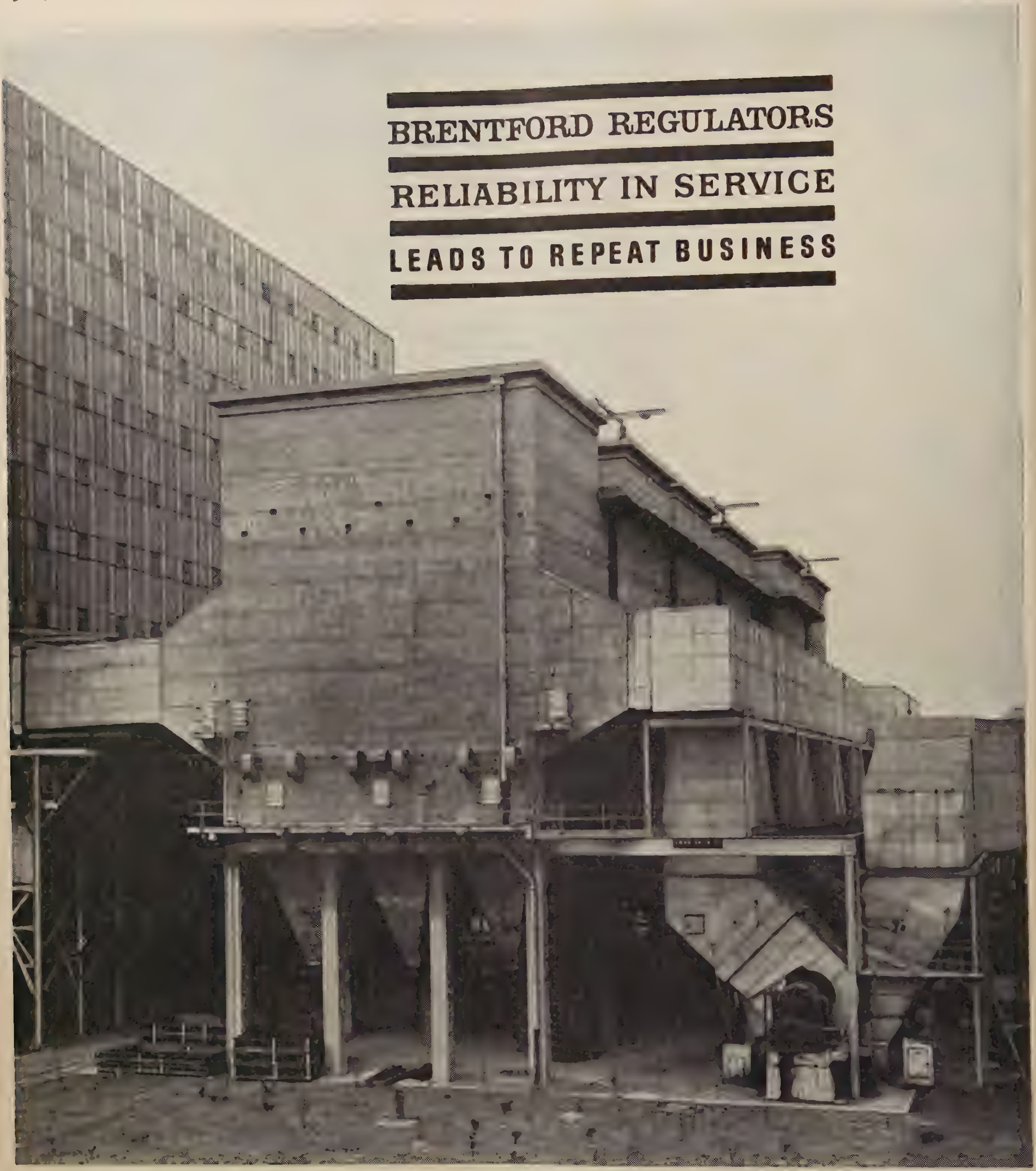
BRENTFORD REGULATORS
RELIABILITY IN SERVICE
LEADS TO REPEAT BUSINESS



Fifteen years ago Lodge Cottrell Ltd. first installed Brentford Regulators to control the Electro-Precipitation of waste gases at Clarence Dock Power Station, Liverpool. "They have," Lodge Cottrell write, "been in operation continuously since that date."

Now, Brentford Regulators are standard equipment for all Lodge Cottrell installations. Shown above is Ferrybridge Power Station where 18 Brentford 50 KVA Regulators control the high voltage input to give maximum corona and, at the same time, limited flash-over in all the precipitation chambers.

Brentford Transformers Limited, Manor Royal, Crawley, Sussex. Tel: Crawley 27755. *A Member of the GHP Group*

BRENTFORD

U.K. Electrical Trade in October

THERE was a recovery in electrical exports in October from the seasonally low figures of the previous two months, but the total exports in the three months August-October were only 12·5 per cent above the level of a year earlier compared with an increase of 20 per cent in the period May-July. And it must be remembered that the October figures last year were depressed by the dock strike. The total electrical exports for the ten months of 1961, namely £215 million, were 14 per cent higher than for the corresponding period of last year.

Of the main Commonwealth markets, only New Zealand showed an advance on last year, though exports to South Africa increased by £2 million. On the other hand, exports to the countries of the European Free Trade Association were 21 per cent higher than in the first ten months of last year and those to the Common Market countries rose by 37 per cent. Exports to these two groups of countries now account for 22 per cent of total U.K. electrical exports.

Electronic and radio apparatus continues to show the strongest advance with a ten months' total of £45·4 million, 30 per cent more than in the corresponding period of 1960. The leading items have been cathode-ray tubes and other valves, communications and navigation equip-

TABLE I.—ELECTRICAL EXPORTS

Class	Month of Oct. 1961	Ten months ended October 1960	1961
	£	£	£
Generating sets:			
Diesel driven not exceeding 10 kW ...	108,614	1,246,205	1,070,786
10 kW to 65 kW	86,633	1,331,549	1,294,297
65 kW to 200 kW	210,488	1,096,961	1,096,975
Over 200 kW	170,006	1,577,037	2,919,367
Driven by steam turbines	50,536	695,237	326,893
Driven by spark ignition engines, hydraulic turbines or other prime movers ...	23,107	287,186	834,723
Generators:			
Not exceeding 200 kW	91,951	852,076	1,253,682
Over 200 kW	306,026	916,518	811,880
Parts	445,630	6,063,284	5,196,871
Motors, complete, other than railway, tramway and trolley-bus—			
Not exceeding ⅛ h.p.	207,081	2,207,147	2,065,686
Exceeding ⅛ h.p. but under 1 h.p. ...	64,871	684,910	852,546
From 1 to 250 h.p.	566,488	4,551,930	5,087,719
Exceeding 250 h.p.	154,348	1,635,643	1,602,730
Railway, tramway and trolley-bus motors, complete, and parts of all motors ...	153,750	1,853,567	2,174,272
Starting and controlling gear for electric motors	344,978	2,634,930	3,589,004
	2,984,507	27,634,180	30,177,431
Converting machinery	10,418	688,262	738,567
Mercury-arc rectifiers	55,802	434,272	654,723
Transformers for lighting, heating and power (incl. coils):			
Not exceeding 7,500 kVA	462,984	4,423,669	4,046,826
Over 7,500 kVA	86,927	2,738,241	3,536,132
Switchgear and switchboards (excl. telegraph and telephone):			
Switchgear up to 200 A and not exceeding 660 V	462,248	4,315,109	4,720,994
Other	974,238	10,466,163	11,442,617
	2,052,617	23,065,716	25,139,859
Batteries and/or cells, primary:			
For all lighting purposes	143,088	1,076,376	1,372,747
For radio	345,581	3,923,324	3,750,226
Other	46,059	396,436	462,241
Parts (excl. carbons)	64,275	516,224	678,852
Filament lamps exceeding 28 V	111,617	940,980	1,083,662
Not exceeding 28 V	37,647	273,947	340,897
Fluorescent tubular lamps	115,120	651,839	897,425
All other lamps	56,566	316,144	390,427
Parts (excl. glass bulbs and carbons) ...	70,010	459,630	717,234
Radio and television, etc., apparatus:			
Thyratrons, hot cathode mercury vapour and gas-filled rectifiers (excl. mercury-arc rectifiers), photo-electric cells (excl. photo-transistors), stabilising and cold cathode valves, magnetrons, klystrons ...	72,172	538,843	761,722
Cathode ray tubes	152,009	529,989	1,225,567
All other	610,185	4,043,777	5,904,195
Parts (excl. glass bulbs)	35,015	505,416	593,884
Broadcasting and television transmitters	68,262	603,528	682,281
Communication and navigational and radar equipment	1,406,900	14,092,326	17,442,620
Domestic receiving sets, mains	32,386	681,081	511,760
Battery (incl. complete vibrator sets) ...	54,364	775,743	875,739
Other (incl. mains/battery and radio for cars)	26,623	265,649	323,661
Radiograms	24,842	275,831	262,138
Television receiving sets	218,627	740,539	1,124,136
Public address equipment	115,445	960,586	948,654
Other radio and television apparatus, n.e.s.	281,467	1,195,430	2,308,831
Components and parts, n.e.s.	1,328,647	11,117,438	12,446,052
	4,426,944	36,326,176	45,411,240
Telegraph and telephone installations ...	611,445	5,758,354	4,701,651
Telephone instruments	139,356	1,610,674	1,786,200
Parts	819,172	6,331,187	8,319,073
Line app. for long distance communication	243,929	2,126,360	2,847,312
	1,813,902	15,826,575	17,654,236
Cookers	30,863	420,205	399,132
All other cooking appliances	81,699	556,452	591,311
Parts and accessories	76,360	823,381	786,558
Space heating appliances	47,936	259,284	279,590
Water heating appliances	28,457	274,883	379,209
Other heating appliances	97,317	305,849	492,181
Parts and accessories	126,707	863,824	1,188,598
Irons	71,177	700,916	707,979
Arc welding equipment, a.c.	31,999	445,818	489,540
D.c.	75,720	496,244	482,699
Resistance welding	17,482	351,743	454,537
Electric furnace plant	255,866	941,445	1,214,395
Sparking plugs	281,356	2,017,116	2,112,451
Electrical appliances for aircraft	282,898	2,803,502	3,096,024
For motor vehicles	514,646	5,610,392	6,022,486
For cycles	33,457	497,402	345,640
Signalling apparatus (incl. traffic signals) ...	100,534	1,165,090	1,586,624
Instruments, commercial	231,125	1,904,181	2,018,453
House service meters (electrical) incl. parts	150,590	1,454,172	1,622,420
Electro-medical apparatus (excl. deaf-aids, X-ray apparatus and batteries)	47,372	438,726	395,425
X-ray apparatus (excl. tubes and valves) ...	134,541	498,078	768,288
Ceiling fans	58,714	801,773	981,932
Desk fans, and parts of desk and ceiling fans	24,831	264,213	369,992
Vacuum cleaners	259,643	1,675,156	2,285,860
Floor polishers	46,051	635,824	540,293
Food mixers	88,086	555,892	907,390
Hair clippers and dry shavers	226,974	975,820	1,283,720
Other portable appliances	103,130	336,966	665,034
Parts, etc.	192,801	1,760,324	1,771,405
Portable tools, incl. parts	312,781	2,412,711	2,972,404
Telegraph and telephone cables and wires:			
Submarine	2,695	1,545,934	158,128
Other	363,187	3,241,168	3,569,687
Other descriptions:			
Cotton, silk or man-made fibres insulated	11,720	242,169	284,865
Enamel, glass or asbestos insulated ...	173,590	1,170,188	1,411,241
Paper insulated	564,034	5,269,813	4,921,743
Rubber insulated	277,912	2,537,233	2,707,489
Thermoplastic insulated	338,177	3,014,709	3,469,087
Other	204,815	1,864,651	2,036,719
	1,936,130	18,885,865	18,558,959
Accumulators for motor vehicles ...	149,609	1,295,684	1,505,432
For radio, and other portable	39,184	347,591	378,961
All other accumulators	86,462	485,236	788,307
Parts and accessories	94,550	849,501	1,091,133
Electric wiring accessories	226,351	2,018,380	2,374,953
Electrical ware (incl. insulators) of ceramic materials, n.e.s.	158,335	1,148,595	1,330,896
Industrial electronic control equipment ...	245,596	1,673,084	1,990,119
Insulators and insulating materials, n.e.s.:			
Cloth and tape	55,244	668,314	606,360
All other	145,152	1,255,657	1,405,413
Permanent magnets	82,198	639,018	679,910
Radio, telegraph and telephone testing equipment, n.e.s.	149,436	1,329,937	1,516,596
Scientific electrical instruments (excl. telegraphic and telephonic; time recorders and time switches)	775,491	4,271,240	6,443,830
All electric machinery, apparatus and appliances, n.e.s.:			
Machinery	67,758	459,671	518,833
Other	1,100,319	9,490,645	10,703,168
TOTAL	21,610,861	188,473,347	215,180,917

TABLE 2.—DISTRIBUTION OF EXPORTS (TABLE 1)

Country	Month of Oct. 1961	Ten months ended October 1960	1961
	£	£	£
Gibraltar	13,191	213,953	297,038
Malta	66,462	430,301	555,719
Cyprus	76,158	590,274	773,300
Sierra Leone	44,663	359,059	600,306
Ghana	266,670	2,402,807	3,277,966
Nigeria	426,882	4,759,664	4,204,447
Republic of South Africa	1,375,546	12,801,094	14,860,884
Rhodesia and Nyasaland	411,975	5,974,254	5,941,377
Tanganyika	71,767	459,821	508,441
Kenya	202,412	1,786,093	1,670,855
Uganda	32,780	336,758	517,632
Mauritius	30,096	706,014	350,247
Aden	98,818	561,535	815,589
Bahrain, Qatar and Trucial States ...	151,109	1,151,388	1,452,427
Kuwait	167,269	1,824,459	2,331,940
India	981,907	12,498,189	11,314,082
Pakistan	370,790	3,241,984	3,260,434
Singapore	236,737	2,099,087	2,243,016
Federation of Malaya	363,130	2,049,717	3,038,185
Ceylon	202,927	1,675,616	1,804,430
British North Borneo	17,657	189,784	219,992
Sarawak	16,600	154,618	110,947
Hong Kong	654,703	3,921,145	4,886,203
Australia	1,661,119	17,209,424	16,906,920
New Zealand	1,267,533	7,948,373	10,681,823
Fiji	31,072	175,701	281,020
Canada	678,327	10,422,447	9,856,332
Bermuda	50,720	325,844	535,316
Bahamas	38,110	449,442	381,585
Jamaica	115,207	1,611 544	1,619,458
Barbados	45,507	336,873	343,088
Trinidad	128,390	1,354,162	1,361,644
British Guiana	60,554	652,609	516,034
Other Commonwealth countries ...	111,259	871,063	1,072,723
Irish Republic	511,827	4,175,756	5,257,735
Soviet Union	190,117	1,196,581	2,249,668
Finland	319,353	1,702,911	1,938,915
Sweden	710,761	4,876,119	5,646,817
Norway	439,161	2,714,035	3,438,878
Denmark	355,056	2,596,974	3,347,333
Poland	104,685	832,759	1,310,507
Western Germany	835,417	5,261,228	7,228,920
Netherlands	1,036,209	6,115,445	9,140,322
Belgium	372,449	2,856,279	3,118,091
France	470,436	3,233,380	5,004,111
Switzerland...	266,357	1,437,221	2,217,608
Portugal	156,833	1,908,583	1,784,598
Spain	200,431	1,814,821	2,091,554
Italy	572,428	4,064,161	5,449,302
Austria	123,320	683,772	981,993
Yugoslavia	78,964	937,207	933,322
Greece	137,521	912,096	1,778,922
Turkey	141,324	1,005,327	2,109,737
Portuguese East Africa	32,443	433,683	279,979
Egypt	60,477	906,855	1,169,147
Libya	74,785	591,646	649,982
Morocco (including Tangier)	11,557	276,960	197,447
Congo Republic	22,822	388,456	377,883
Sudan	104,606	1,228,380	1,552,980
Syria	25,427	366,721	559,248
Lebanon	48,485	512,694	714,717
Israel	64,397	866,834	1,436,616
Jordan	270,916	664,900	1,022,819
Saudi Arabia	90,045	514,008	725,043
Iraq	175,758	2,227,935	2,714,283
Iran	172,310	1,093,571	2,686,120
Burma	67,921	516,333	597,102
Thailand	69,723	621,625	614,553
Indonesia	204,911	871,117	1,916,998
China	26,055	1,086,404	611,466
Japan	107,470	638,127	785,321
United States of America...	974,570	10,425,643	9,206,016
Cuba	5,786	283,316	267,579
Mexico	65,745	899,389	927,292
Colombia	25,546	414,589	449,970
Venezuela	108,289	2,753,305	929,160
Peru	59,847	263,244	515,330
Chile	48,089	747,395	1,074,051
Brazil	118,981	439,318	872,547
Uruguay	14,872	217,402	167,637
Argentine Republic	513,615	3,872,469	3,848,008
Other foreign countries	554,717	3,481,277	4,691,820
TOTAL	21,610,861	188,473,347	215,180,917

TABLE 3.—SOURCES OF ELECTRICAL IMPORTS

Country	Month of Oct. 1961	Ten months ended October 1960	1961
	£	£	£
Australia	58,527	374,036	587,860
Canada	222,786	1,151,819	1,989,029
Other Commonwealth countries ...	346,754	2,239,959	2,802,670
Irish Republic	192,485	1,146,863	1,346,080
Sweden	221,343	1,142,455	2,264,176
Denmark	87,051	698,589	998,780
Western Germany	1,002,894	7,543,596	9,014,937
Netherlands	738,489	5,812,489	6,155,478
Belgium	85,162	425,161	539,302
France	255,756	1,894,554	2,760,413
Switzerland...	171,857	1,651,796	2,108,799
Italy	129,386	1,395,382	1,139,670
United States of America...	1,980,624	16,078,637	16,715,180
Other foreign countries	362,357	2,200,188	4,070,025
TOTAL	5,855,471	43,755,524	52,492,399

ment, television receiving sets and components and parts of the foregoing equipment.

Of the other main categories of electrical equipment only cables and wires have failed to surpass the 1960 level and even here the difference is now small. Exports of electrical machinery by the end of October were 10 per cent higher than a year earlier with marked advances in large generating sets, certain types of industrial and traction motors and control gear. The end-October level of exports of transformers and switchgear was 8 per cent higher than a year earlier and that of telegraph and telephone equipment 10 per cent higher. Advances were also recorded in space and water heating appliances and parts, equipment for aircraft and motor vehicles, house service meters, vacuum cleaners, food mixers, dry shavers, wiring accessories, scientific instruments and electric washing machines.

Electrical imports by the end of October were 20 per cent higher than at the corresponding point last year. The United States and Western Europe were the main suppliers.

TABLE 4.—OTHER ELECTRICAL AND ALLIED EXPORTS

Class	Month of Oct. 1961	Ten months ended October 1960	1961
	£	£	£
Domestic electric washing machines incorporating centrifugal water extraction	327,710	2,793,627	3,698,007
Other, with or without wringers ...	260,045	2,445,178	2,287,988
Dryers (exported as separate units) ...	32,503	350,200	297,766
Parts	156,613	1,237,096	1,580,619
Electric locomotives (incl. battery types)	3,324	3,180,953	1,577,758
Diesel locomotives with electric transmission	—	2,125,167	176,144
Welding electrodes:			
Ferrous	166,689	1,156,699	1,118,067
Non-ferrous	51,270	254,597	326,102
Electric conduit tubes and cased tubes...	111,964	862,408	931,231
Electric carbons	343,927	1,299,012	1,999,669
Electric lighting fittings and lanterns (excl. arc lamps, searchlights and cycle lamps)	361,192	3,267,043	3,466,428
Electric fork-lift trucks	167,080	982,981	1,626,182
Water and gas turbines, etc.	406,284	4,164,732	7,541,107
Steam turbines	655,853	10,551,969	6,960,711

TABLE 5.—ELECTRICAL IMPORTS

Class	Month of Oct. 1961	Ten months ended October 1960	1961
	£	£	£
Generators, incl. parts	127,537	915,748	1,129,922
Motors, incl. parts...	290,316	1,927,209	2,484,638
Convertors; transformers; rectifiers ...	142,524	1,646,675	1,569,789
Switchgear and switchboards (other than telegraph and telephone)	164,971	1,491,132	1,961,075
Bulbs, arc lamps and tubes for electric lighting, complete	125,862	891,714	1,128,943
Cathode ray tubes, complete	69,659	494,517	402,033
Transistors (incl. photo-transistors), complete	151,955	1,110,280	986,002
Other, complete	247,036	2,475,046	2,478,088
Parts (excl. glass bulbs)	79,518	876,643	812,019
Radio receiving sets, domestic or portable	186,619	462,772	1,084,228
Radio communication and navigational aids, complete	707,635	4,525,419	5,398,629
Other radio and TV apparatus, parts and accessories	497,543	4,008,596	4,537,503
Telegraphy and telephony apparatus ...	77,555	546,311	768,422
Welding machinery	87,252	611,704	957,448
Electric cooking and heating apparatus	273,526	1,719,616	2,215,528
Magnetos, ignition, and electrical appliances for aircraft, motor vehicles and cycles	307,650	3,038,493	3,209,168
Instruments, commercial	114,222	856,230	1,130,217
Electro-medical apparatus (incl. X-ray apparatus)	132,163	955,260	1,299,740
Portable mechanical appliances, electrically operated, complete	165,547	1,296,921	1,678,790
Parts	55,110	565,182	573,831
Industrial electronic control equipment	119,577	562,000	1,114,547
Scientific electrical instruments (excl. telegraphic and telephonic)	303,878	2,373,202	2,440,227
Other machinery, apparatus and appliances	1,427,816	10,404,854	13,131,612
TOTAL	5,855,471	43,755,524	52,492,399

MEM

'GLASGOW-EXEL'

HEAVY DUTY

Composite Units of Switches & Fuses

Complying with B.S.3185: 1959

Designed for use on large industrial and power systems.

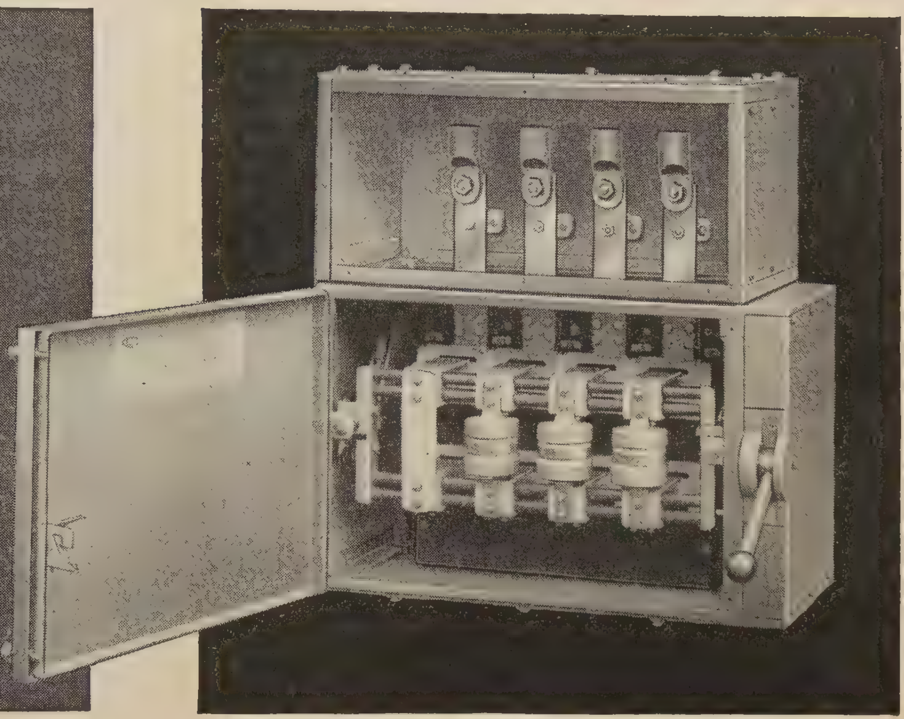
500-600-800 Amps

440 Volts A.C.

T.P., T.P. & N.

FOUR POLE

(Three phase & switched neutral).



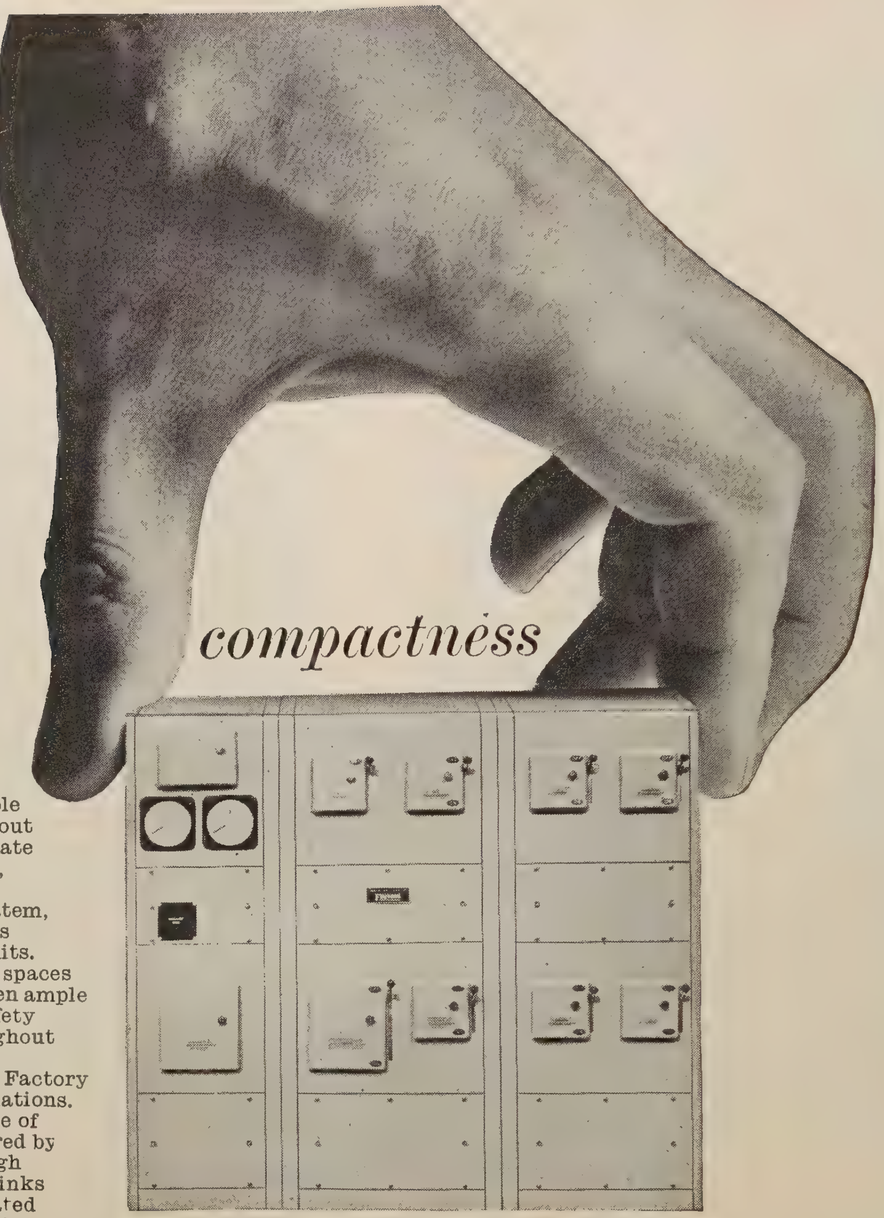
When the "Glasgow-Exel" is fitted with suitable current limiting H.R.C. cartridge fuse-links, it is capable of closing on to 440 volt, 35 M.V.A., 3-phase faults. Making and Breaking Capacity Tests. B.S.3185: 1959, requires a test voltage not less than 110 per cent of rated voltage and a current not less than three times normal current rating at a power factor not greater than 0.3 lagging.

The 800 amp "Glasgow-Exel" dealt effectively with an applied test current of 2,400 amps at 485 volts with a power factor of 0.25 lagging.

Write for List No. 450R

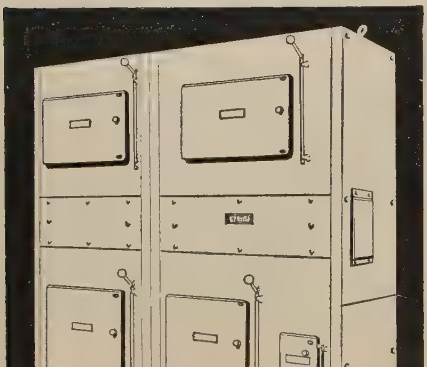
MIDLAND ELECTRIC MANUFACTURING CO. LTD. REDDINGS LANE TYSELEY BIRMINGHAM 11

Take just one point.....



The compact design of FLUVENT cubicle type switchgear is a valuable factor. Particularly valuable because it is achieved without prejudice to safe and adequate clearances between phases, and phases to neutral throughout the bus-bar system, and in the interconnections between bus-bars and circuits. The requirements of cable spaces and phase barriers are given ample consideration, too, and safety guards are provided throughout to comply with the appropriate sections of the Factory Acts and Electricity Regulations. The superiority of this type of switchgear is further assured by AEROFLEX rewireable High Breaking Capacity Fuse-Links which withstand the repeated applications of severe closing surges without deterioration.

* *Please write for lists SB3 and CF2.*



AEROFLEX
Fluvent

CUBICLE TYPE **SWITCHBOARDS**

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NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 243a, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged, but, in some cases, not yet announced

MONDAY, 4th DECEMBER

Birmingham.—College of Advanced Technology, Gosta Green, 6.30 p.m. I.E.E. South Midland Centre. "The Banana Tube Colour Television Display System," by Dr. P. Schagen. Combined meeting with Birmingham Centre of the Institution of Post Office Electrical Engineers.

Bolton.—Railway Hotel, Trinity Street, 7.45 p.m. A.S.E.E. Bolton Branch. "Recent Developments in Semiconductors," by A. Bulman.

Glasgow.—Royal College of Science and Technology, 6 p.m. I.E.E. Scottish Electronics and Measurement Group. "Precision Measurement," by G. H. Rayner and A. Felton.

Halifax.—Griffin Hotel, George Street, 7.45 p.m. A.S.E.E. Halifax Branch. "A Complete Lighting Scheme," by K. F. Haylor.

Harwell.—Reactor School, A.E.R.E., 7.30 p.m. A.S.E.E. Oxford and Districts Branch. "Electronic Control in Industry."

Ilford.—Angel Hotel, Broadway, 8.15 p.m. A.S.E.E. South Essex Branch. "The Highfield Shield," by D. H. Taylor.

Liverpool.—Royal Institution, 6.30 p.m. I.E.E. Mersey and North Wales Centre. "Simulation of Intelligence," by Prof. D. M. MacKay.

London.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Electronics and Communications Section. Discussion on "Backward Waves in Waveguides," to be opened by Dr. P. J. B. Clarricoats, R. A. Waldron and G. H. B. Thompson.

Tudor Room, Caxton Hall, S.W.1, 6.30 p.m. Electrical Power Engineers' Association, London Technical Group. "D.C. Transmission," by T. E. Calverley.

John Adam Street, Adelphi, W.C.2, 6 p.m. Royal Society of Arts. Cantor Lecture. "Some Problems of British Export Trade—III—Overseas Marketing," by R. Falk.

Hotel Russell, W.C.1, 2.30 p.m. Institute of Metal Finishing. Annual general meeting. 7.30 for 8 p.m. Annual dinner.

Newcastle-upon-Tyne.—Rutherford College of Technology, Northumberland Road, 6.15 p.m. I.E.E. North Eastern Measurement and Electronics Group. "Planning and Installation of the Sound Broadcasting Headquarters for the B.B.C.'s Overseas and European Services," by F. Axon and O. H. Barron.

County Hotel, Neville Street, 6.30 p.m. North East Electrical Club. "Sheik's Delight" (Lighting a palace in Kuwait), by R. W. Shaw.

Sheffield.—Royal Victoria Hotel, 7.30 p.m. A.S.E.E. Sheffield Branch. "The Nature of Lightning and its Effects," by K. Walton.

MONDAY, 4th to FRIDAY, 8th DECEMBER

London.—Earls Court. Smithfield Show.

TUESDAY, 5th DECEMBER

Bradford.—Institute of Technology, 6.30 p.m. I.E.E. North Midland Centre. "The Potentialities of Artificial Earth Satellites for Radiocommunication," by W. J. Bray.

Cardiff.—South Wales Institute of Engineers, 7 p.m. I.E.E. Cardiff Graduate and Student Section. Films evening.

Edinburgh.—Carlton Hotel, 7 p.m. I.E.E. Scottish Electronics and Measurement Group. "Precision Measurement," by G. H. Rayner and A. Felton.

Adelphi Hotel, Cockburn Street, 7.30 p.m. Institution of Plant Engineers, Edinburgh Branch. Discussion evening. Question Master, G. E. H. Lewis.

London.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurement and Control Section. "Domains and Domain Patterns," by Prof. L. F. Bates.

White Hart, 49, King's Road, Chelsea, S.W.3, 7.45 p.m. A.S.E.E. West London Branch. "Fault Consideration on Distribution Systems and Installations," by J. H. Duncan.

Eltham Green School, Queenscroft Road, Eltham, S.E.9, 7.45 p.m. A.S.E.E. South East London Branch. "Radiovisor Parent, Ltd.", by G. A. G. Ive.

Royal Society of Arts, John Adam Street, Adelphi, Strand, W.C.2, 7 p.m. Institution of Plant Engineers, London Branch. "The Fuel Cell," by F. T. Bacon.

Manchester.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North Western Utilisation Group. "Recent Developments in the Specification, Performance and Design of Contactor Control Gear," by R. A. F. Craven.

Newcastle-upon-Tyne.—Institute of Mining and Mechanical Engineers, Neville Street, 6.30 p.m. Institution of Heating and Ventilating Engineers, North East Coast Branch. "Experience in America of Heating and Air Conditioning Practice," by C. S. K. Benham.

Norwich.—Assembly House, 7.30 p.m. I.E.E. East Anglian Sub-Centre. "The Design and Performance of High and Low Tension Terminal Boxes," by K. K. Schwarz.

Nottingham.—People's College of Further Education, Castle Road, 7.30 p.m. A.S.E.E. Nottingham Branch. "Recent Developments in the Soviet Union," by Dr. D. F. Galloway.

Reading.—Social Club, Caversham, 7.30 p.m. A.S.E.E. Reading and Districts Branch. "Small-bore Heating," by B. Raynor.

Workington.—College of Further Education, 7 p.m. I.E.E. North Eastern Centre. "Some Notes on the Electrical Requirements of General Cargo Docks," by E. R. Radway.

WEDNESDAY, 6th to FRIDAY, 8th DECEMBER

London.—Olympia. National Poultry Show.

WEDNESDAY, 6th DECEMBER

Brighton.—S.E.E.B. Offices, 10, Queen's Gardens, Hove, 6.30 p.m. I.E.E. Southern Centre. "The Protection of High-Voltage Insulators from Power-Arc Damage," by Dr. A. E. Guile.

Leicester.—University, 6.45 p.m. British Institution of Radio Engineers, East Midlands Section. "Transistors in Computers and Control Equipment," by P. James.

Grand Hotel, 7.30 p.m. Institution of Plant Engineers, Leicester Branch. "Silicones in Engineering Applications," by G. B. Ingram.

London.—Savoy Place, W.C.2, 6 p.m. I.E.E. Education Discussion Circle. Discussion on "Teaching Protective Systems," to be opened by G. Heywood.

Wood Green Civic Centre, N.22, 8 p.m. A.S.E.E. North London Branch. "Space Flight," by Dr. N. H. Langton.

Middlesbrough.—Cleveland Scientific and Technical Institution, 6.30 p.m. I.E.E. Tees-Side Sub-Centre. "Technical and Economic Aspects of the Supply of Reactive Power in England and Wales," by W. Casson and H. J. Sheppard.

Manchester.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North Western Electronics and Communications Group. "Generation and Amplification in the Millimetre Wave Field," by W. E. Willshaw.

Newcastle-upon-Tyne. — Percy Building, King's College, Queen Victoria Road, 6.15 p.m. I.E.S. Newcastle-upon-Tyne Centre. "The Use of Coloured Light," by J. W. Bessant. Joint meeting with the North East Electric Club.

Portsmouth.—Royal Air Force Association Club, Cosham, 7.30 p.m. A.S.E.E. Portsmouth and District Branch. "Heat Pumps," by Miss M. V. Griffith.

Preston.—Farmer's Arms Hotel, Market Street, 7.30 p.m. A.S.E.E. Preston Branch. "Electrical Insulating Tapes—Techniques and Applications," by E. J. M. Rosenthal.

Wolverhampton. — Wolverhampton and Staffordshire College of Technology, 10 a.m. British Institution of Radio Engineers, West Midlands Section. "New Electronic Techniques in Non-Destructive Testing."

THURSDAY, 7th DECEMBER

Brighton.—Cricketers' Hotel, Black Lion Street, 7.30 p.m. A.S.E.E. Brighton, Hove and District Branch. "Engineering in a Sugar Refinery," by J. A. Pearson.

Cardiff.—Bowchier Hall. I.E.S. Cardiff Centre. "Visual Problems of Motorways," by J. M. Waldram.

Cheltenham.—Technical College, 7 p.m. I.E.E. Bristol Graduate and Student Section. "Transistors *v.* Valves," by A. W. Hart.

Coventry.—Hotel Leofric, 7.30 p.m. Institution of Plant Engineers, Birmingham Branch. "Electronic Control in Industry with Particular Reference to Automation."

Farnborough.—Technical College, 6.30 p.m. I.E.E. Southern Centre. Graduate and Student Section. "The Synthesis of Speech for Communication Purposes," by H. L. Chesters.

Hull.—Lecture Theatre, Y.E.B. Offices, Ferensway, 6.30 p.m. I.E.E. North Midland Centre. "Electricity in the Chemical Industry," by P. McDermot.

Lincoln.—E.M.E.B. Showrooms, 191, High Street, 7.30 p.m. I.E.E. East Midland Centre. Discussion on "Semiconductors for Light Current Engineering," to be opened by L. Rushforth.

London.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Parsons Memorial Lecture. "Magnetohydrodynamics," by Prof. M. W. Thring.

Prince of Wales Hotel, S.W.19, 8 p.m. A.S.E.E. South West London Branch. "Floor Warming," by J. E. Cook.

Maidstone.—Wig and Gown, 6.30 for 7 p.m. I.E.E. Maidstone Branch. "Electronics in the Postal Mail Services," by G. P. Copping.

Manchester. — Demonstration Theatre, N.W.E.B., Town Hall Extension, 6 p.m. I.E.S. Manchester Centre. "Fundamental Principles of Street Lighting," by C. S. Bayliffe.

Middlesbrough.—Cleveland Scientific and Technical Institution, 7.30 p.m. Society of Instrument Technology, Tees-Side Section. "Electronic Controllers," by A. H. Isaac.

Nottingham.—Electricity Centre, Carrington Street, 6 p.m. I.E.S. Nottingham Centre. "The New I.E.S. Code," by A. Roberts.

FRIDAY, 8th DECEMBER

Birmingham.—Lecture Theatre, Byng Kendrick Suite, Gosta Green College of Technology, Aston Street, 7 p.m. Society of Instrument Technology, Midland Section. "Instruments in Clinical Chemistry," by N. Crawford, and "Electronics in Surgery," by R. Lightwood.

Cardiff.—Grand Hotel. A.S.E.E. South Wales Branch. Annual dinner.

Crewe.—Royal Hotel, 7.30 p.m. A.S.E.E. Stoke and Crewe Branch. "Estimating in Relation to Electrical Installation Contracts," by W. H. Brooks.

Gloucester.—Technical College, 7.30 p.m. I.E.E. Western Centre. "Some Unusual Types of Electrical Machinery," by Prof. G. H. Rawcliffe.

London.—Savoy Place, W.C.2, 6 p.m. I.E.E. Medical Electronics Discussion Group. Discussion on "The Peltier, Hall and Seebeck Effects."

Newcastle-upon-Tyne.—Crows Nest Hotel, Barras Bridge, 7.30 p.m. I.E.E. North Eastern Graduate and Student Section. Annual "smoker."

Financial Section

STOCKS and SHARES

STOCK EXCHANGE markets stood up fairly well to the confusion caused by the breach in the Government's wages policy, but leading shares in the electrical manufacturing section suffered a severe relapse upon the publication of a warning statement from English Electric about prospects for this year's profits and dividends. This relates the now familiar experience of increased turnover but diminishing profit margins, and in the absence also of the expected improvement by D. Napier & Son the company has to modify the forecast, made last June, of the maintenance of the dividend at a total of 10 per cent. This, according to the statement, cannot now be assumed: the amount of the final payment will have to be determined in the light of the full annual results, and of prospects for 1962.

Fall in Prices

English Electric's cautionary statement inevitably recalled the announcement in similar vein by Associated Electrical Industries two months earlier. Profits of this group for the first half of the current year were shown indeed to be a little up on the corresponding figures for 1960, but in maintaining the interim dividend at the same amount as before the board advised shareholders that they should not necessarily assume from this that the total would remain at the current rate of 15 per cent. Prices of the shares concerned were marked down very sharply after the English Electric statement, the company's own shares falling by 4s 3d to 27s, and those of A.E.I. and G.E.C. by more than 2s to 31s 6d and 26s 3d respectively.

Confused Markets

An uneasy state of mind has prevailed in the industrial market as a whole since the wages pause policy was upset by the award to the electricity supply workers. Although, however, share prices gave ground all along the line, changes were not particularly severe except in cases affected also by individual company news. Neither were movements all in the downward direction. The quotation of Aberdare Holdings at 12s "ex" both scrip and "rights" issue was equivalent to their best price of the year, and Electrical Apparatus at 22s 6d earned the same rare distinction after the issue of the annual report. Lodge Plugs were marked up several shillings on news of the bid of 16s 6d from Morgan Crucible, and moved well above that figure after the announcement of the board's view that it was inadequate.

Another warning about dividend prospects for the current year came from the chairman of Duport, and the price of the 5s shares was reduced

Price Changes in

Company or Board	Nom. Value	Middle price 27th Nov.	Week's Rise or Fall	Dividend Pre-vious	Dividend Last	Yield % £	s	d	1961 High-est	1961 Low-est
Gilt-edged Stocks										
Brit. Elec. 1968/73	100	74½	−1	3	3	4	0	6	75½	70½
Brit. Elec. 1974/77	100	69	−½	3	3	4	7	0	70½	64½
Brit. Elec. 1976/79	100	70	−1	3½	3½	5	0	0	73½	67
Brit. Elec. 1974/79	100	79	−½	4¼	4¼	5	7	6	82	75
Brit. Elec. 1967/69	100	91	−½	4½	4½	4	19	0	92	86
Overseas Electric Supply										
Calcutta Elec.	£1	21/3		7†	7½†	11	11	0	22/3	20/6
East African Power	£1	12/-	−6d	8	10	16	13	3	15/-	12/-
Nigerian Elec.	£1	18/6		10	14	15	2	9	19/9	15/6
Perak Hydro-Elec.	£1	21/-	+6d	15	15	14	5	9	23/6	17/6
Electrical Shares										
Aberdare Holdings	5/-	12/-x.a.	+3d	17½	17½		—		12/-	10/9
Aerialite	1/-	4/3	−3d	54	40	9	9	6	8/-	4/3
Allen, W. H.	£1	25/-		14	10*	8	0	0	42/6	25/-
Allied Insulators	5/-	8/3		20	10*	6	1	3	10/-	8/-
Alwyn Holdings	5/-	22/-	+3d	12½	15*	3	8	3	22/3	16/6
Anglo-Portuguese Tel.	£1	19/6		9	9	9	4	9	25/-	18/9
Arcolectric	1/-	5/6	+3d	15	15	2	14	6	6/-	3/9
Astaron Electronics	5/-	25/-	−1/3	15	15		—		30/-	17/-
Assoc. Elec. Ind.	£1	31/6	−2/6	15	15	9	10	6	48/6	28/9
Babcock & Wilcox	£1	22/6		9	9		—		36/6	19/-
Bakelite	10/-	42/6		17½	17½*	4	2	3	60/-	42/-
Baldwin, H. J.	2/-	1/-		10	Nil		—		1/9	1/-
Berry's Electric	5/-	62/6	−1/3	30	33⅓*	2	13	6	63/9	37/-
Bowthorpe Holdings	2/-	7/6		18½	22	5	17	6	10/3	7/6
Brit. Elec. Resistance	2/-	7/3		17½	17½*	4	16	6	8/9	6/6
Brit. Elec. Traction: Def. Ord. "A"	5/-	52/6	−1/3	40	50	4	15	3	57/6	41/9
British Electronic Ind.	5/-	11/3	−6d	—	15	6	13	3	15/3	8/9
B.I. Callender's	£1	56/9	−2/-	13½	13½	4	15	0	62/3	49/6
B.I. Callender's 6% Pref.	£1	17/-		6	6	7	1	3	18/3	16/6
British Thermostat	5/-	33/9		20	27½	4	1	6	40/-	28/-
Brook Motors	10/-	51/3	−6d	25	25*	4	17	6	55/-	47/-
Bruce Peebles	10/-	15/6	−6d	10	Nil		—		21/-	13/3
Bulgin, A. F.	1/-	12/-	−3d	55	40*	3	6	9	13/3	7/9
Bulpitts	5/-	16/-		15	16¼	5	1	6	27/6	16/-
Burco Dean	5/-	5/9	−3d	18	15		—		11/9	5/9
Cable & Wireless	5/-	17/-	−3d	10	10*‡	2	18	9	19/9	12/6
Cambridge Instruments	5/-	29/-	−1/-	12½†	22	3	15	9	38/6	29/-
Chloride El. Storage "A"	£1	74/6	+9d	17½	20	5	7	6	91/-	72/-
Clarke Chapman	£1	37/6	−1/6	13¾	13¾	7	6	9	54/-	37/6
Clarke, T.	2/-	4/-		16	16	5	6	9*	5/3	3/6
Combined Elec. Mfrs.	4/-	7/3	+3d	—	12½	6	18	0	10/-	6/9
Contactor Switchgear	5/-	14/3		14	14	4	18	3	16/-	12/6
Crabtree	10/-	24/9	−9d	12½	12½	5	1	0	33/9	23/-
Crompton Parkinson	5/-	12/9		12½	12½	4	18	0	14/6	11/3
De La Rue	10/-	53/-	−5/9	22½	22½*	4	5	0	70/-	44/6
Decca "A"	10/-	65/-	−1/-	23⅓	23⅓	3	11	6	70/-	52/3
Desoutter	5/-	58/9	+1/3	30	35	2	19	6	68/9	49/-
Dewhurst	2/-	5/9		20	20	3	9	6*	6/6	3/9
Dictograph Tel.	2/-	10/9		20	20	3	14	6	13/-	8/6
Dimplex	5/-	48/9	−2/3	30	35*	2	3	3*	55/6	28/3
Dubilier Condenser	1/-	2/3		30	15*	6	13	3	3/-	2/-
Duport	5/-	9/6	−2/-	20	13⅓*	7	1	0	17/-	9/6
E.M.I.	10/-	42/-		17½	17½	4	3	3	51/3	35/3
Eleco	2/-	10/6		20	20*‡	3	16	3	10/6	4/3
Electrical Apparatus	5/-	22/6	+1/-	20	22	4	17	9	22/6	17/-
Electrical Components	5/-	8/9		11½	12½	7	2	9	9/9	7/9
Elec. Construction	£1	20/-	−3d	9	5	5	0	0	39/-	20/-
Elliott-Automation	5/-	38/9	+1/3	9·3	13	1	13	6	38/9	25/6
Enfield Rolling Mills	£1	35/6	−2/-	15	15	8	9	0	51/6	35/6

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

* After scrip issue. † Free of income tax. ‡ Dividend indicated.

sharply to 9s 6d. Heavy engineering shares remained friendless, and there were further relapses in Tube Investments to 61s 3d and Westinghouse to 24s. A 3s fall in Hoover to 46s 6d showed the trend in domestic equipment issues. Ever Ready, however, advanced to a new peak of 41s3d.

Elliott-Automation

An interim report from Elliott-Automation, covering the first three-quarters of the current year, contrasted cheerfully with much of the news that has been coming lately from other branches of the electrical industry. Both orders received and deliveries made were said to have been substantially above last year's corresponding levels, and profits estimates showed a corresponding improvement. The decision to leave the interim dividend unchanged at 5 per cent defers to the Chancellor's wishes on the subject and consideration of a larger distribution is being postponed until the time of the final declaration, which was made last time in April and brought the total to 13 per cent. Thus encouraged, the 5s shares moved up to about their best price of the year, 38s 4d. A yield of under 1¾ per cent measures their popularity as a "growth" stock.

Decca Prospects

At Decca Record's annual meeting Sir Edward Lewis was able to refer to 1960–61 as the best year in the company's history—despite the effects of acute depression in the television industry—and to give a decidedly encouraging account of the outlook. Shareholders were told that the current year was going well: overall turnover of records was ahead of last year, better things were expected of the radio and television interests, while the Navigator and radar activities continued to expand. With the usual reservations, the chairman looked forward to another satisfactory year's trading. As known previously, profits of the group, after tax, came out nearly level with the previous year's, and covered twice over the unchanged dividend of 2s 4d per share.

S. Smith's Capital Plans

Having financed their development mainly out of profits retained in the business for many years, S. Smith and Son (England) intend now to redress the balance between fixed-interest and equity capital by raising fresh funds through the former type of security. One result of this change of policy should be to permit the distribution of a larger proportion of available profits. It is hoped that a 40 to 45 per cent ratio will permit increases in the dividend in future years. In his review with the annual report, the chairman makes a tentative forecast of this year's sales at £41 million (against £38·4 million in 1960–61) and of profits around £3 million (against £2·7 million last time). Much will depend, however, upon the level of demands from the motor industry and upon the outcome of pay claims in relation to production costs.

Electrical Investments

Company or Board	Nom. Value	Middle price 27th Nov.	Week's Rise or Fall	Dividend		Yield %			1961	
				Previous	Last				Highest	Lowest
Electrical Shares—continued						£	s	d		
English Electric	£1	27/-	−4/3	10	10	7	8	3	40/9	26/3
English Electric 3¾% Pref. ...	£1	10/9		3¾	3¾	7	0	0	11/9	9/9
Ever Ready	5/-	41/3	+6d	20	22½	2	14	6	41/3	31/6
Falk Stadelmann	£1	23/6		7½	8¾	7	9	0	26/-	21/9
G.E.C.	£1	26/3	−2/3	10	10	7	12	6	39/6	24/3
G.E.C. 6½% Pref.	£1	17/-		6½	6½	7	13	0	19/3	16/6
General Cables	5/-	4/9		15	Nil		—		6/3	4/9
G.H.P. Group	£1	19/-		6	7‡	7	7	3	24/6	17/-
Goblin (B.V.C.)	5/-	4/6		12½	10	11	2	0	8/6	4/3
Hackbridge Holdings	5/-	4/6	−6d	20	10*	11	2	0	6/9	4/6
Harland Engineering	5/-	13/6	+6d	16	16	5	18	6	19/-	12/-
Head Wrightson	5/-	21/6	−1/-	14	16	3	14	6	30/-	20/-
Heatrae	2/-	16/9		12½	25	2	19	9	19/-	12/6
Holophane	5/-	16/3	−6d	30	30	9	4	6	20/6	14/6
Hoover	5/-	46/6	−3/-	90	45*	4	16	9	55/6	37/6
Hunt, A. H.	4/-	19/3		20	20	4	3	0	25/9	17/6
Intl. Combustion	5/-	25/6		20	30	5	17	9	33/9	22/9
Intl. Computers & T.	£1	95/-	−1/3	10	11¼	2	7	3	107/-	59/-
Johnson & Phillips	£1	20/-	−1/-	Nil	5	5	0	0	24/-	17/6
Kenwood Mfg.	1/-	3/3		—	—		—		6/-	3/3
Laurence Scott	5/-	15/-		15	15	5	0	0	18/9	14/3
Lister, R. A.	£1	55/-	−1/3	14	14	5	1	9	56/9	45/6
Lucas, J.	£1	56/3	−9d	13¾	13¾	4	17	9	71/6	50/-
Marryat & Scott	2/-	16/9		27½	32½	3	17	6	18/6	13/9
Mather & Platt	£1	38/-	−1/6	11	11	5	15	9	51/6	36/-
Metal Industries	£1	52/6		15	15	5	14	3	66/6	46/3
Midland Elec. Mfg.	£1	56/3		12	12	4	5	6	67/6	52/6
Murex	£1	40/-	−1/-	20	13*	6	10	0	51/6	37/6
Newman Ind.	2/-	7/-		12½	15	4	5	9	7/6	5/-
Oldham & Son	1/-	2/6		17½	17½*	7	0	0	3/-	2/3
Parmiter, Hope & S.	1/-	2/-		12½	20	10	0	0	2/5	1/6
Parsons, C. A.	£1	52/3	−1/6	9⅜	12½	4	15	9	72/6	46/9
Philips' Lamps	Fl.10	195/-	−5/-	16	16*	1	12	9	£13¼	£9¾
Plessey	10/-	43/9	−6d	17	15*‡	3	8	6	45/-	35/3
Pullin Group	2/-	10/3	−3d	25	25	4	17	6	15/-	10/-
Pyrotenax	5/-	43/9		40	45	3	17	0*	48/9	34/9
Radiation	£1	25/-		12	10	8	0	0	37/6	22/6
Reliance-Clifton	5/-	19/6		15	20	3	8	3*	22/-	14/9
Reyrolle	£1	42/-	−1/-	17½	9⅜*	4	12	9	51/6	36/6
Richardsons Westgarth	10/-	3/9		8⅓	Nil		—		8/3	3/6
Sanders, W. H.	2/-	18/9	−1/3	17½	17½‡	1	17	3	28/3	14/-
Sangamo Weston	10/-	23/9	−1/9	13⅓	10‡*	4	4	3	25/9	18/9
Scott, James	5/-	28/9	−3d	25	27½	4	15	9	32/-	25/6
Simon Engineering	5/-	32/6	−3d	—	27½	4	4	6	43/9	28/-
Smith (England), S.	4/-	15/6	−6d	20	20	5	3	3	23/9	13/9
Southern Areas	£1	16/-	−1/-	5	6	7	10	0	23/-	14/6
Strand Elec.	5/-	19/3		14·6	20	5	4	0	20/-	12/3
Sturtevant	5/-	8/9	−6d	15†	13†	12	2	0	18/6	8/9
Sun Elec.	5/-	16/3	+3d	18½	18½	5	13	9	17/6	14/3
T.C.C.	10/-	41/3		35	22½*	5	9	0	43/9	40/-
Telephone Rentals	5/-	27/-	+9d	15	15‡*	2	15	6	29/6	18/6
Thompson (John)	5/-	12/-	−6d	20	5		—		16/9	12/-
Thorn Elec.	5/-	62/6	+2/6	25	25	2	0	0	63/-	44/6
Thornycroft	4/-	4/3		6	—		—		7/-	4/3
Tube Investments...	£1	61/3	−3/9	—	14	4	11	6	85/-	54/-
Ultra Electric	5/-	22/9	+9d	20	25		—		31/3	12/6
Walsall Conduits	4/-	10/6		15	15	5	14	3	15/-	9/9
Ward & Goldstone	5/-	27/-		35	17½*	3	4	9	36/6	25/6
Watford	2/-	6/9		25	20*	5	18	6	10/9	6/6
Westinghouse	£1	24/-	−2/-	11	11	9	3	6	45/-	24/-
West, Allen	5/-	10/-	−3d	12½	13⅓	6	15	0	14/6	10/-
Wilkins & Mitchell	5/-	8/3		21	12	7	5	6	15/3	8/3
Wolf Electric	5/-	12/9		12½	13¾	5	7	9	17/6	12/6

REPORTS and DIVIDENDS

English Electric Co., Ltd.—In a letter to shareholders, Lord Nelson of Stafford, chairman, warns them that, although turnover has increased and the volume of new orders overall has been maintained during the year, profits for 1961 are likely to be appreciably lower than those for 1960. There has been a further deterioration in margins both at home and overseas, and the expected improvement at D. Napier & Son has not materialised. These factors, combined with the effect of the measures introduced by the Government in July, indicate that lower profits may be expected.

At the time of the offer for W. H. Dorman & Co., Ltd., last June, Lord Nelson said that while it was too early in the year for them, in the light of present-day uncertainties, to forecast the profits for their current financial year, they would, in the absence of unforeseen circumstances, expect to recommend a final dividend for 1961 on the ordinary capital of the English Electric Co., as increased as a result of the Dorman & Co. offer, at the same rate as the final dividend paid for the last financial year, i.e. 7 per cent making 10 per cent for the year. He now says that the amount of the final dividend will be determined at the appropriate time on a consideration of the final audited figures and the prospects for 1962.

British Electric Resistance Co., Ltd.—Mr. H. Paul-Huhne, chairman and managing director, says in his annual report that the higher profit for the year ended 31st July, 1961, has been attained by increased sales although at reduced profit margins. Approximately £26,000 has been expended during the year on new manufacturing plant.

Although the company continues to expand its sales and range of products and to widen its activities in the home market, says Mr. Paul-Huhne, export figures were disappointing, with the exception of Australia. During the year the company sold its one-third interest in Cerl-Dale, Ltd., following its acquisition by Hathaway Instruments, Inc. The existing arrangements for the sale of Berco products will continue in Canada, however, where the company will also gain the benefit of Hathaway's intensive sales programme, although no substantial increase in exports is expected until the Canadian economy improves. It is intended to deal directly with Canadian sales, instead of going through the company's subsidiary, International Power Transformers, Ltd., and to repatriate that company's assets in accordance with the Chancellor's request.

The value of orders in hand is satisfactory, says Mr. Paul-Huhne, and there is an 11 per cent increase in incoming orders for the first two months of the current year over the corresponding period last year. Production is also at a satisfactory level and, providing industry suffers no general recession, there is no reason why the current year's trading should not be as good as that of the year under review.

Crabtree Electrical Industries, Ltd.—A large turnover has been associated with a smaller proportionate return, despite improved production methods, says Mr. J. A. Crabtree, chairman. Finding it difficult to assess the outlook, he says that in certain directions there are signs of slackening in industrial activity, although the company's output is still at a maximum. The full impact of the credit squeeze, however, has yet to be felt.

Record sales were achieved in the year ended 31st July, 1961, reflecting increased space and new production techniques, and further extensions are in hand.

J. & F. Stone Lighting & Radio, Ltd.—It has been decided to go ahead with the formation of a property company, but the board has been advised that to distribute the property company's shares as a free bonus at the present time would involve taxation and other problems. For the time being, therefore, the property company will remain a wholly-owned subsidiary of the group. The board is, however, recommending a free bonus issue of stock in the parent company to existing shareholders on a one-for-two basis.

Subject to profits being maintained at a satisfactory level, and in the absence of any unforeseen circumstances, the board intends to recommend a dividend on the capital, as increased by the proposed bonus issue, of 30 per cent for the year ending 30th June, 1962, equivalent to 45 per cent on the present capital.

Elliott-Automation, Ltd.—During the first nine months of the current year, orders received and deliveries made by the group, as now constituted, showed a substantial advance over the same period of last year. Provisional figures indicate that profits show a corresponding increase. In view of the Chancellor's request for dividend restraint, however, the directors have maintained the interim dividend at 5 per cent, less tax, and will consider when appropriate an increase in the final dividend.

Nuclear Graphite, Ltd.—The A.E.I.-John Thompson Nuclear Energy Co., which already holds half of the shares in this company, is to acquire the other half (5,000 £1 shares) from the Morgan Crucible Co. for cash.

Allied Ironfounders, Ltd., are reducing their interim dividend from 7½ per cent to 5 per cent. Although group sales for the first 28 weeks of the financial year show a slight increase over the corresponding period of last year, profits have fallen 17 per cent as a result, say the directors, of increased manufacturing and operating costs.

Harland Engineering Co., Ltd., is maintaining an interim dividend of 4 per cent. Sales are expected to be approximately the same as last year but profit margins are reduced and the final results will be considerably less than those for 1960, it is stated. The order intake remains substantial.

K.G. (Holdings) - F. H. Wheeler Amalgamation.—The ordinary shareholders in K.G. (Holdings), Ltd., have been offered 1s shares in F. H. Wheeler & Co., Ltd., at 2s each on a one-for-nine basis.

The directors of F. H. Wheeler expect profits for the year ending 31st March, 1962, to be not less than those for the year ended March, 1961, and they would then recommend a dividend at the rate of 25 per cent on the ordinary shares, payable in October, 1962.

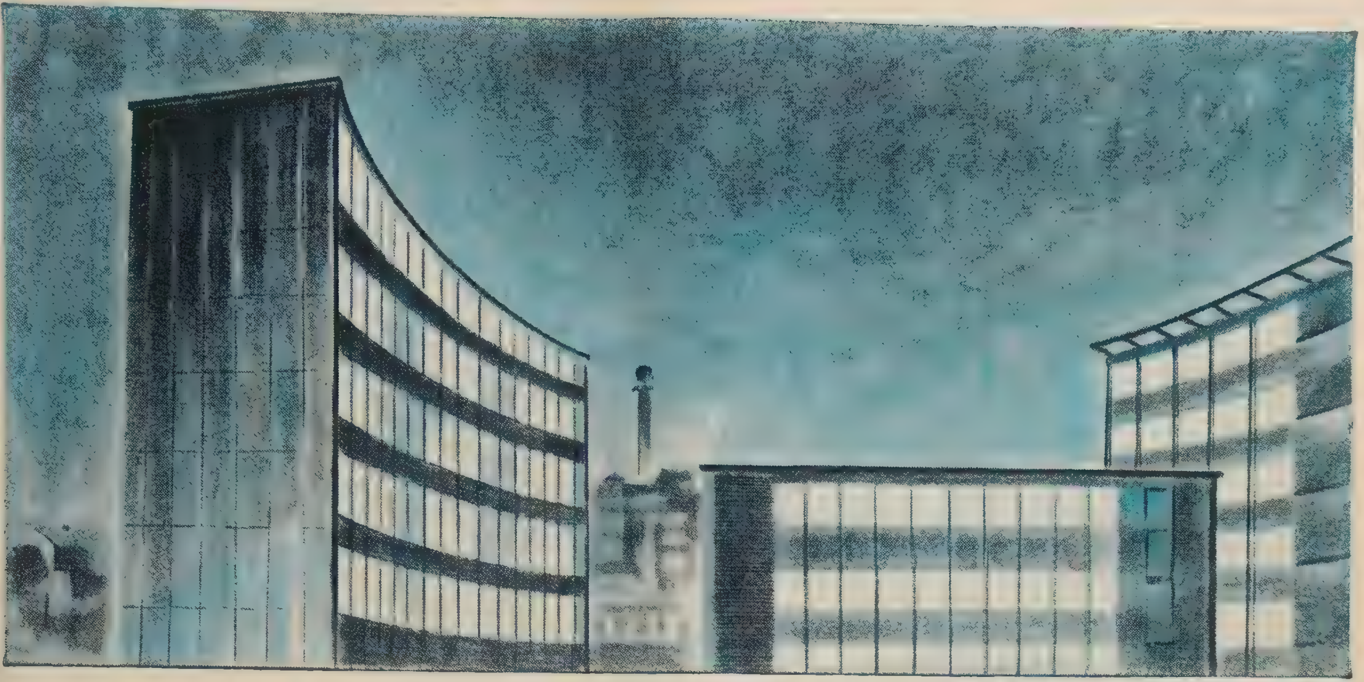
Philips Incandescent Lamp Works Holding Co.—Sales in the first nine months of this year amounted to 3,299 million fl., an increase of 2 per cent over the figure for the corresponding period in 1960. The increase, say the directors, is lower than that envisaged in the 1960 report. They expect that sales in 1961 will be higher than in 1960 but will not reach the level of 5,000 million fl., previously forecast. Trading profit for the first nine months was 496 million fl. (592 million fl.), which after tax and other charges, reduces to 220 million fl. (271 million fl.).

Efco, Ltd.—Interim dividend of 3½ per cent (the same).

George Kent, Ltd.—Interim dividend 2½ per cent (the same).

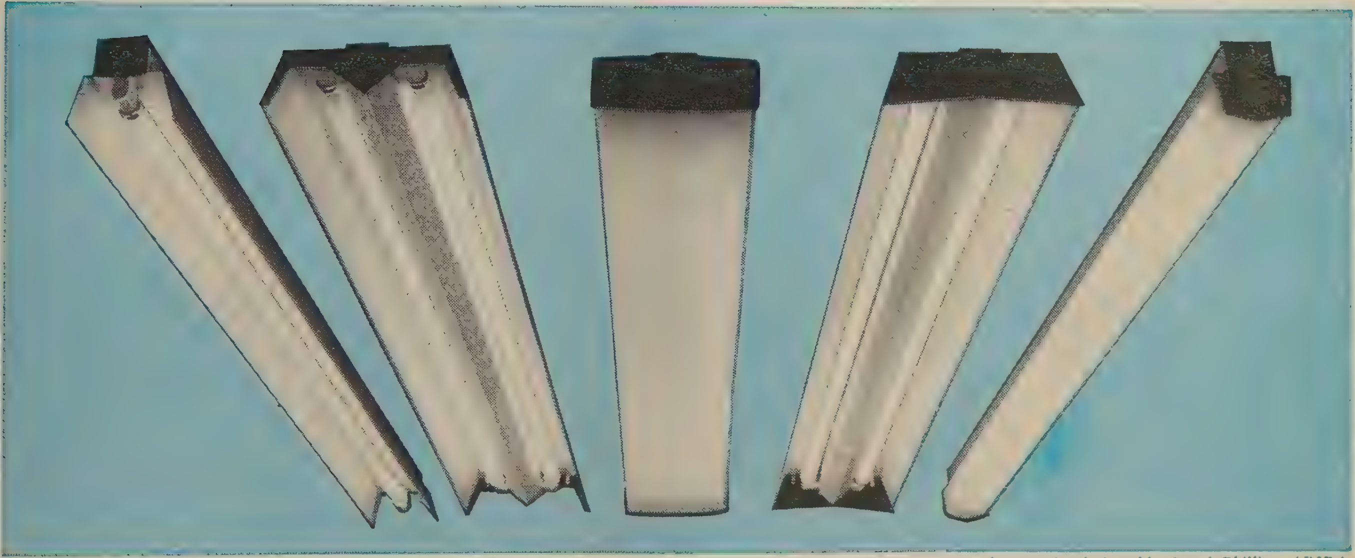
Joseph Lucas (Industries), Ltd., is to raise a long-term loan outside the sterling area to meet the cost of current overseas developments. Sir Bertram Waring, chairman, says that direct exports last year were a record.

(*Continued on page* 903)



ULTRASLIM

FLUORESCENT LIGHTING FITTINGS



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FINANCIAL SECTION (*continued*)

New Companies

Rolls-Colston Appliances, Ltd.—Registered 17th November. Capital £250,000. Manufacturers of and dealers in dishwashers, etc. Directors: Sir Charles B. Colston, M. Colston, R. R. Harris, J. Bloom and H. Oppenheim. Solicitors: Forsyte, Kerman & Phillips, 11, Mansfield Street, W.1. Regd. office: Alderman's House, Bishopsgate, E.C.2.

Lamberth & Barnett, Ltd.—Registered 15th November. Capital £100. Electricians, etc. Directors: M. J. Lamberth and A. D. Barnett. Secretary: Jean Lamberth. Regd. office: 214, Lower Road, Great Bookham, Surrey.

Louis J. Schaverien (Appliances), Ltd.—Registered 15th November. Capital £1,000. Manufacturers of and dealers in electrical goods, etc. Directors: L. J. Schaverien and Mrs. Georgia H. Schaverien (secretary). Regd. office: 38, Great Portland Street, W.1.

S. Hammond Electrical Contractors, Ltd.—Registered 17th November. Capital £1,000. To acquire the business of electrical contractors carried on by Robert B. Green at Wandsworth, S.W.18 as S. Hammond & Co., etc. Directors: R. B. Green and J. A. Fahy (secretary). Regd. office: 316, York Road, Wandsworth, S.W.18.

Surrey Electrical Installations (Contracting), Ltd.—Registered 20th November. Capital £1,000. Directors: J. L. Tuckfield, L. R. Hardy (secretary), G. P. Miles and R. L. White. Regd. office: 27, Station Way, Cheam, Surrey.

C.C.T.V., Ltd.—Registered 11th October. Capital £1,000. Designers, manufacturers of and dealers in industrial and domestic electric equipment, etc. Directors: C. Birks and K. M. Bridger. Secretary: Margaret N. Birks. Regd. office: 35, Frogmoor, High Wycombe.

Fellows & Fullwood, Ltd.—Registered 25th October. Capital £5,000. Electrical wholesale suppliers, etc. Directors: W. V. Fellows and A. Fullwood (secretary). Regd. office: 21, Queens Cross, Dudley, Worcs.

Sabel-Deutsch, Ltd. — Registered 10th November. Capital £100. Manufacturers of and dealers in connectors, plugs, sockets, relays, etc. Directors: B. Shaw and J. Bishop (secretary). Regd. office: 9, Ormond Close, Boswell Street, W.C.1.

Electronic Instrumentation & Systems Engineering Co., Ltd.—Registered 13th November. Capital £600. Directors: J. A. Sadowski (secretary) and Mrs. Anna Zgorska. Regd. office: 35, Cromwell Grove, W.6.

Coliga Electrics, Ltd.—Registered 13th November. Capital £100. Subscribers: Shirley Hart (secretary) and A. Hart. First directors to be appointed by the subscribers. Regd. office: 713, Imperial House, Kingsway, W.C.2.

Heatrod Elements, Ltd.—Registered 14th November. Capital £100. Electrical engineers, etc. Regd. office: 120, St. George Street, Norwich.

Actuator Control Gear, Ltd.—Registered 17th November. Capital £1,000. Manufacturers of and dealers in machinery of all kinds, in particular electric motors, etc. Directors: D. Sharp and J. Woodhead. Secretary: D. E. G. Wing. Regd. office: 56, Little Horton Lane, Bradford, 5.

Liquidations

Winding-up proceedings or liquidations are often undertaken for the purpose of reconstruction, the transfer of a business, or other reasons. The appearance of a company's name under this heading therefore does not necessarily indicate insolvency.

Valcon Electrical, Ltd., 152, Plumstead Road, London, S.E.18, dealers in electrical goods.—Meetings of creditors and contributories 6th December at Inveresk House, 346, Strand, London, W.C.2.

Valley Electrics, Ltd., 65, Potternewton Lane, Leeds, dealers in domestic appliances. —First and final dividend of 3s 4d in the £, payable at the Official Receiver's Office, Pearl Chambers, East Parade, Leeds.

E. Duckworth (Preston), Ltd., 106, Leyland Road, Penwortham, nr. Preston, electrical contractors.—Last day for receiving proofs for dividend 8th December. Liquidator, Mr. J. Tye, 20, Byrom Street, Manchester.

Ratcliff (Electric), Ltd., Lodge Works, Spital Hill, Sheffield, 4, electrical engineers and contractors.—Liquidator, Mr. P. Cardwell, 93, Queen Street, Sheffield, 1, appointed by members and creditors 16th November. Claims to the liquidator by 31st December.

Winding-up Orders

Lee Guinness, Ltd., 9-13, King William Street, London, E.C.4.—Winding-up order made 15th November.

Snelson's Electrical (M/cr.), Ltd., 86, West Park Street, Salford, 5.—Winding-up order made 13th November.

Bankruptcies

D. Cornish, electrical engineer and contractor and hardware retailer, carrying on business at 6 and 8, Maperton Road, Bradford, Yorks., under the name of Cornish & Graham. —Trustee, Mr. G. E. Rushton, 36, North Parade, Bradford, released 6th November.

B. D. Toon and **T. E. Poole**, formerly trading in co-partnership under the style of Keverley Services, electrical dealers, at 625, Bath Road, Brislington, Bristol; 123, Grosvenor Road, St. Pauls, Bristol; Ashley Road, Bristol; and Boar's Head Yard, St. George's Road, Bristol.—Receiving order made 20th November on a creditor's petition.

A. C. Jones, Belmont, Cemetery Road, Houghton Regis, Bedfordshire, lately residing at 67, Pomfret Avenue, Luton, electronic technician.—Public examination 11th January at the Court House, Stuart Street, Luton.

J. B. English, carrying on business at 1, Harrogate Court, Corby, Northants., under the style of W.M.S. (Corby), electrical engineer.—Public examination 5th January at the County Hall, Northampton.

A. Owen and **L. G. A. Shaw**, lately carrying on business in co-partnership under the name of "Owen & Shaw," at Corner Shop, Cross Roads, Hixon, Staffs., electrical contractors.—Last day for receiving proofs for dividend 8th December. Trustee, Mr. W. H. Meredith, 12, Lonsdale Street, Stoke-on-Trent.

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 15th December.

Cutene. No. 809,795. Class 6. Tungsten alloys in the form of plates or shaped sections, for use in the manufacture of electrodes for arc welding, spark arrestors, line circuit-breakers and of the like.—Compagnie Industrielle des Metaux Electroniques, France. Address for service: Haseltine, Lake & Co., 28, Southampton Buildings, Chancery Lane, London, W.C.2.

Design (framed picture of a hawk). No. 814,239. Class 6. Glands for cables.—Hawke Cable Glands, Ltd., Ashworth Street, Denton, Lancs.

Triax. No. 806,202. Class 7. Electrically and hydraulically operated storage apparatus. —Triax Equipment, U.S.A. Address for service: Marks & Clerk, 57 and 58, Lincoln's Inn Fields, London, W.C.2.

Silvercel and design including "Andre Yardney," No. B804,991. Class 9. Electric cells, batteries and accumulators, incorporating electrodes containing silver. Design only. No. B804,992. Electric batteries, cells and accumulators.—Yardney International Corp., U.S.A. Address for service: Raworth, Moss & Cook, 38, Sydenham Road, Croydon, Surrey.

Hitachi No. B811,836. Class 9. Synchron-frequency modifiers, condensers, convertors, transformers, apparatus for controlling the speed of electric motors by means of current control, computers, power distribution apparatus, precipitators, welding apparatus, electric irons, telephone apparatus, electron discharge tubes (not for lighting purposes), semiconducting devices, switchboards, current rectifiers, electron microscopes, radio and television apparatus, etc.—Kabushiki Kaisha Hitachi Seisakusho, Japan. Address for service: Marks & Clerk, 57 and 58, Lincoln's Inn Fields, London, W.C.2.

Telapproach. No. B812,231. Class 9. Scientific apparatus, and electrical and electronic devices.—American District Telegraph Company, U.S.A. Address for service: Stevens, Langner, Parry & Rollinson, 5-9, Quality Court, Chancery Lane, London, W.C.2.

Supertrode. No. 821,650. Class 9. Electrodes for electric welding.—Stone Marine Engineering Co., Ltd., Woolwich Road, Charlton, London, S.E.7.

Stelcar. No. 823,290. Class 9. Electrodes for electric welding.—Deloro Stellite, Ltd., Highlands Road, Shirley, Solihull, Warwickshire.

Ship design. No. 823,652. Class 9. Electric batteries. No. 823,653. Class 11. Flashlight bulbs.—Nam Jam Factory, Ltd., Kowloon, Hong Kong. Address for service: Marks & Clerk, 57 and 58, Lincoln's Inn Fields, London, W.C.2.

Knitex. No. 824,606. Class 9. Radio-frequency shields.—Knit-Mesh, Ltd., 36, Victoria Street, London, S.W.1.

Batilla, Pelsola, Latamo, Pabula and **Dabata.** Nos. 823,673, 823,677, 823,681, 823,685 and 823,693. Class 10. Electrically heated pads for warming and airing beds, and electrically heated blankets. **Pelsola.** No. 823,678. Class 11. Installations for lighting, heating, steaming, cooking, refrigerating, drying and ventilating purposes.—A.E.I.-Gala, Ltd., 33, Grosvenor Place, London, S.W.1.

Permalite. No. 798,951. Class 11. Electric hand lamps.—Meyer Manufacturing Co., Ltd., Kowloon, Hong Kong. Address for service: D. Young & Co., 9, Staple Inn, London, W.C.1.

Atlas. No. 808,822. Class 11. Installations for lighting.—Thorn Electrical Industries, Ltd., Thorn House, St. Martin's Lane, London, W.C.2.

Pyrotubes. No. B819,300. Class 11. Electric tubular heating elements.—Metals Research, Ltd., 91, King Street, Cambridge.

ConStor. No. 821,244. Class 11. Heating appliances and installations.—Bastian & Allen, Ltd., Ferndale Terrace, Harrow, Middlesex.

Sanfire. No. 821,322. Class 11. Electric incinerators.—General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.

Frescon. No. 824,714. Class 11. Installations for lighting, heating, steam generating, cooking, refrigerating, drying, ventilating, water supply and sanitary purposes.—A.E.I.-Birlec, Ltd., 33, Grosvenor Place, London, S.W.1.

Timex. No. 803,352. Class 14. Watches and electric clocks.—United States Time Corporation, U.S.A. Address for service: Stevens, Langner, Parry & Rollinson, 5 to 9, Quality Court, Chancery Lane, W.C.2.

ISO (design). No. 815,114. Class 17. Materials for electrical insulation, and insulating elements for electrical apparatus.—L'Isolantite S.A., France. Address for service: Boult, Wade & Tennant, 112, Hatton Garden, London, E.C.1.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Australia.—Brisbane City Council. 19th January. Two 1,050 A resistors. (E.S.B. 35459/61.)*

Bootle.—Borough Council. 9th December. Cable and electrical goods (Schedule 13) and electric lamps (Schedule 14), for one year commencing 1st April, 1962. Borough surveyor, Town Hall, Bootle, 20, Lancs.

Braintree and Bocking.—U.D.C. 29th December. Group "B" street lighting. (See Classified Advertisement Section.)

Cornwall.—County Council. 11th December. Electrical installations (Form No. 18) and passenger lifts and machinery (Form No. 20). County architect, County Hall, Truro.

Costa Rica.—Electrical Institute. 2nd January, 1962. Transmission lines. (E.S.B. 35780/61.)*

Ealing.—Borough Council. 27th December. Renewal of electrical installations in Selborne Primary and Secondary School, Greenford. (See Classified Advertisement Section.)

France.—Headquarters, Allied Forces Central Europe, Camp Guynemer, Fontainebleau. 15th December. Electric lamps. (E.S.B. 36079/61.)*

Heston and Isleworth.—Borough Council. 12th December. New lighting at Isleworth Swimming Baths. Borough engineer and surveyor, 88, Lampton Road, Hounslow.

India.—India Store Department. 28th December. 25 MVA synchronous condenser and control gear for Rourkala substation. 1st January. Aircraft cables. (See Classified Advertisement Section.)

Fertilizer Corporation. 3rd January. Cable. (E.S.B. 36084/61.)*

Madras State Electricity Board. 15th February. Generating plant and switchgear. (E.S.B. 35785/61.)*

Iraq.—Ports Administration, Basrah. 17th December. Street lighting equipment. (E.S.B. 35489/61.)*

London.—Bermondsey Borough Council. 15th January. Electric lamps for the year commencing 1st April, 1962. J. S. Lambert, town clerk, Municipal Offices, Spa Road, S.E.16.

Camberwell Borough Council. 29th December. Electric lamps and fittings, cables and conduit. Borough engineer and surveyor, Town Hall, Camberwell, S.E.5.

Pakistan.—Directorate General, Posts and Telegraphs. 12th/20th December. Cable. (E.S.B. 35746-50/61.)*

Director, Electricity, W.A.P.D.A., Lahore. 13th December. Electrical equipment and appliances. (E.S.B. 36094/61.)*

Romford.—Borough Council. 30th December. Electric lamps (Form M26). Borough engineer, Town Hall, Romford, Essex.

Singapore.—City Council, Electricity Department. 12th December. Cables. (E.S.B. 35704/61.)* 19th December. Distribution and transformer units. (E.S.B. 36097/61.)*

ORDERS PLACED

Buckinghamshire.—Water Board. Two 6in single-stage, split-casing pumps and two 3-stage 4in pressure pumps, driven by Laurence Scott NS type variable speed motors rated at 120 h.p. and 49 h.p. respectively, for the Whitchurch boosting station, including switchgear, etc. (£14,000).—Gwynnes Pumps.

Chester.—Improvement Committee. Electrical switchgear at Sealand Road sewage disposal works (£3,990).—Brookhirst Igranic.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Amlwch.—Factory; Budenberg Gauge & Engineering Co., Ltd., Broadheath, Altrincham.

Basildon.—Community centre in Market Road, Wickford; U.D.C. surveyor, 88, Town Square, Basildon, Essex.

Basingstoke.—New courthouse; county architect, The Castle, Winchester.

Birkenhead.—Works and offices, Cathcart Street; Globe & Simpson, Ltd., 88, Quay Street, Manchester.

Blackpool.—Ten-year scheme of extensions to Victoria Hospital, Whinney Heys; secretary, Regional Hospital Board, Cheetwood Road, Manchester, 8.

Bolton.—Showrooms and offices, Bradshawgate; Wm. Knowles & Son, Ltd., Manchester Road Garage.

Carlisle.—Offices, etc., Lancaster Street, for J. J. Armstrong, Ltd.; Johnston & Wright, architects, 13, Castle Street, Carlisle.

Reconstruction and extension scheme for the Bordery Dairy Co., Shaddongate; S. L. Jack, architect, 35, Warwick Road, Carlisle.

Corby.—Houses (189), North Lawn; manager, Development Corporation, Spencer House, Corby, Northants.

Coventry.—Block of shops, offices and flats, Smithford Way; Calgary & Edmonton Land Co., Ltd., 22, Bruton Street, W.1.

Darlington.—Houses (28), Newton Lane estate; borough architect, Central Buildings.

Doncaster.—Housing accommodation for the aged on various sites; R.D.C. surveyor, Nether Hall.

Dudley.—Wren's Nest Secondary Modern School; J. C. T. Cole & Partners, architects, Central Buildings, Blackheath, nr. Birmingham.

Dunstable.—Multi-storey flats, Southwood Road and London Road; borough surveyor.

Durham.—Divisional police headquarters at Peterlee; county architect, South Street, Durham.

Epsom.—Shops and office block, Church Street; Industrial & Development Services, Ltd., 129, Finsbury Pavement, E.C.2.

Eston.—R.C. church, Teesville; T.G. Construction Co., Ltd., Bowesfield Lane, Stockton-on-Tees.

Finchley.—Library, Church End (£31,000); borough engineer, 294/6, Regent's Park Road, N.3.

Glasgow.—Hostel, Great Western Road; Glasgow and West Scotland College of Domestic Science, Park Drive, Glasgow, C.3.

Harlow.—Factory for Universal Postal Frankers, Ltd.; Wm. Sindall, Ltd., Cherryhinton Road, Cambridge.

Hartlepool.—Houses (101), King Oswy Drive, for North Eastern Housing Association; P. L. Browne, Son & Harding, architects, Northumberland Street, Newcastle-on-Tyne.

High Wycombe. — Factory extension (£100,000); G. D. Searle & Co., Ltd., Land End Road.

Hove.—Police headquarters, Holland Road (£75,000); county architect, County Hall, Lewes.

Huddersfield.—Phase II of new Lindley Hospital; Leeds Regional Hospital Board, Park Parade, Harrogate.

Leeds.—Nurses' training unit, Menston Hospital, Menston; architect to Regional Hospital Board, Park Parade, Harrogate.

Boys' remand home, Whinmoor (£70,000) and aged persons' hostel, Greenside; city architect, Priestley House, Quarry Hill, 9.

London.—Extension to Birkbeck College, Malet Street, Bloomsbury; Adams, Holden & Pearson, architects, 38, Gordon Square, W.C.1.

Factory, Stephenson Street, Canning Town; C. J. Fisk, Ltd., Lincoln Road, E.7.

Laboratory and offices, Fitzalan Road, Finchley; Express Dairy Co., Ltd., 28, Tavistock Place, W.C.1.

Church and hall, High Road, Streatham; T. Peyton & Sons, Ltd., builders, 326, Garratt Lane, S.W.18.

Luton.—Seven-storey factory and offices, Guildford Street; Ellis & Goldstein, Ltd., 40, Guildford Road, Luton.

Macclesfield.—Workshops and offices, Brook Street; Locomotors, Ltd., 154, Grosvenor Road, S.W.1.

Norwich.—Dwellings (158), North Park Avenue area; D. Percival, city architect.

Oxford.—Motel, Northern By-pass; Watney-Lyon Motels, Ltd., 14, Fitzhardinge Street, London, W.1.

Portsmouth.—Office block for Portsmouth Aviation, The Airport; Clayton, Black & Petch, architects, 25, Landport Terrace.

Roehampton.—Home for the blind; A. T. Rowley, Ltd., builders, Cambridge Works, Lordship Lane, N.17.

St. Helens.—Bus garage, Inner Ring Road site (£250,000); borough engineer, Town Hall.

Scarisbrick.—Factory, Scarisbrick estate; Kershaw Bros., Southport Road, Scarisbrick, Lancs.

South Shields.—Houses (107), Reading Road; borough engineer.

Stockton-on-Tees.—New abattoir for Stockton Butchers' Slaughtering Co., Ltd., Laing Street, Stockton (£30,000).

Stoke-on-Trent.—Houses (424), Berry Hill No. 1 site; J. R. Piggott, city architect, Kingsway.

Stourport.—Assembly hall, gymnasium and classrooms for secondary school; Nicol, Nicol & Thomas, architects, 111, New Street, Birmingham.

Surbiton.—Flats (20), Lovelace Road; Donaldson & Co., architects, 75, London Road, Kingston-on-Thames.

Tewkesbury.—Houses (40), Priors Park; borough architect, Municipal Offices.

Tonbridge.—Grammar school for National Spastics Society; Perryams, Ltd., 7, Castle Street.

Tynemouth.—Old people's home, Chirton; borough engineer, 16, Northumberland Square, North Shields.

West Bromwich.—Mental health hostel, Salters Lane (£38,720); borough engineer, Town Hall.

West Molesey.—Factory, Armfield Close estate; Kingston Plastics, Ltd., Union Street, Kingston-on-Thames.

Weybridge.—Flats (63) and houses (36), Oatlands Drive; Span Developments, Ltd., Parkleys, Ham, Richmond, Surrey.

Woking.—Scheme for civic centre (£740,000); U.D.C. surveyor, Woking, Surrey.

Whitstable.—Supermarket at Regal Cinema site; H. Owen Luder, architect, 79, Regency Street, S.W.1.

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* This information is extracted from the Board of Trade *Export Service Bulletin*. Inquiries should be addressed to the Board of Trade, Export Services Branch, Lacon House, Theobald's Road, London, W.C.2 (Telephone: Chancery 4411, Ext. 738), quoting the reference given.

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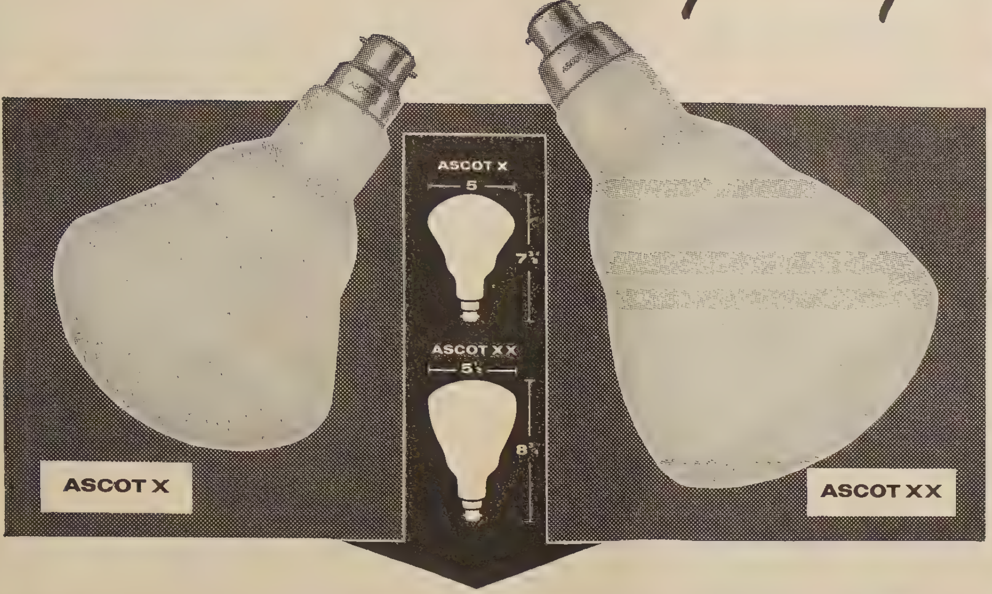

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These new-shape lamps outdate all light-obscuring, dust-collecting globes. They save the cost of shades or globes and reduce time and money spent on cleaning. **Every Ascot X or XX lamp is coated internally with titanium di-oxide made to Patent No. 737861 for durability and extra brilliance without glare,** and guarantees 2,000 hours of the best diffused illumination. FOR DOMESTIC, COMMERCIAL OR PUBLIC PREMISES, in Entrance Halls, Canteens, Kitchens, Bathrooms, Workrooms, etc.

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are being installed by THE ENGLISH ELECTRIC CO. LTD. at HINKLEY POINT NUCLEAR POWER STATION under construction for the C.E.G.B. by The English Electric Co., Babcock & Wilcox and Taylor Woodrow Atomic Power Construction Co.

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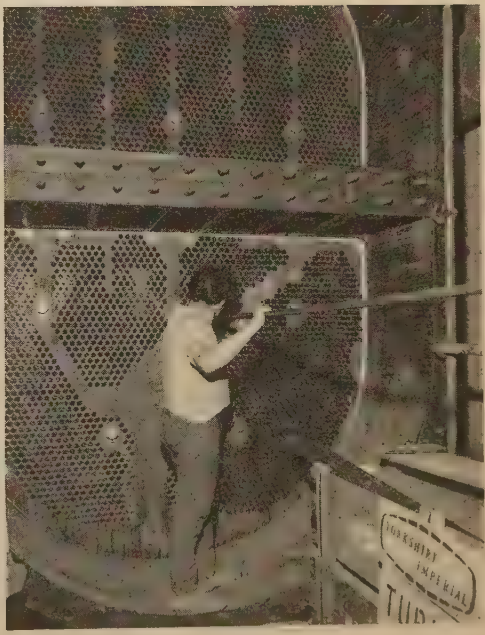

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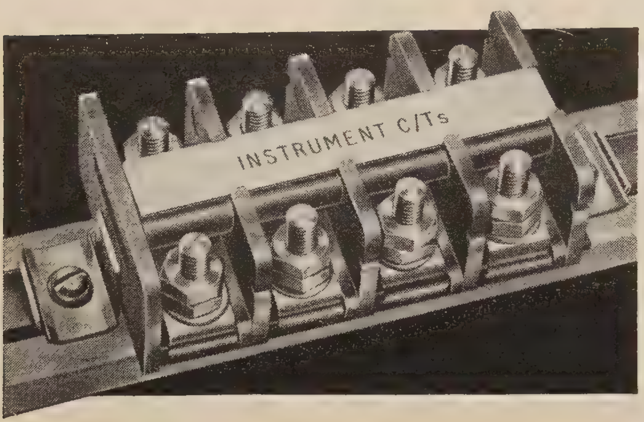

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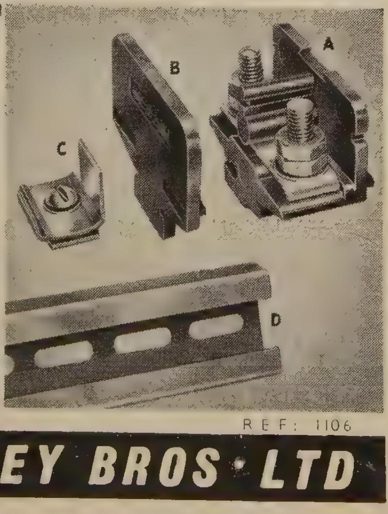

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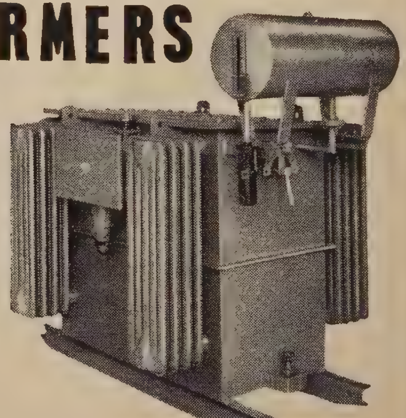

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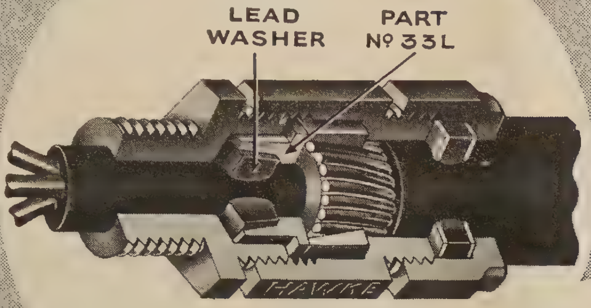

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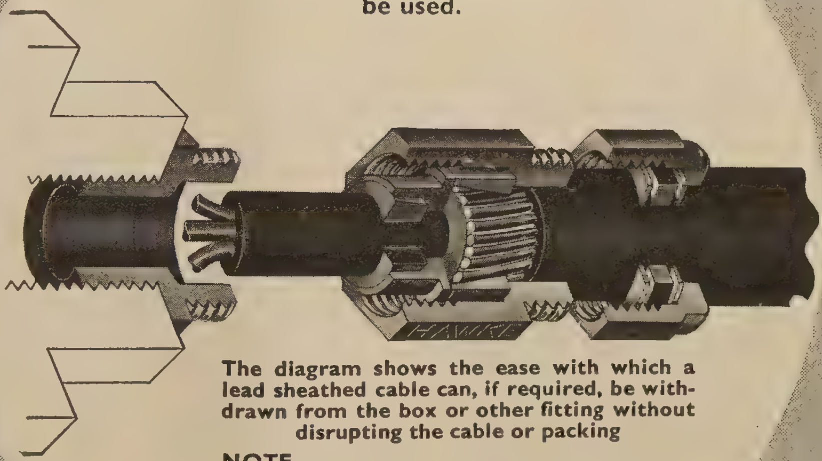

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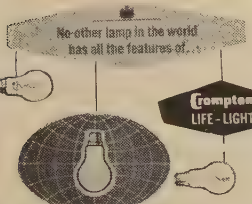
Crompton LIFE-LIGHT

To help you sell these lamps hard we are offering you this point-of-sale and display material. Use it. See your customers buy the lamp that sheds a bright light on your good name.



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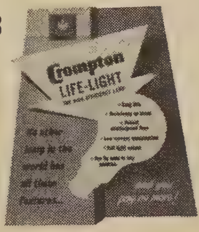

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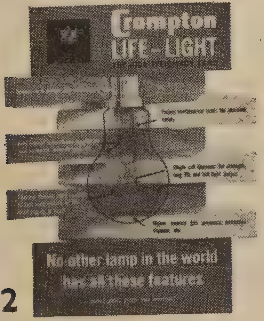

2

4

1. MOBILE. This well balanced and attractive mobile can be used in the window or in the shop.

2. LARGE DISPLAY. This forms the centre piece of a window display or alternatively can be used as a large showcard inside the shop.

3. SHOWCARD. Carries on the 'Life-light' theme. Attractive and striking to look at and takes up very little space. Use on the counter to attract attention.

4. LEAFLETS. These leaflets are your best aid to selling 'Life-light'. They tell the customer exactly why 'Life-light' is a better lamp. They mean repeat buying so see that they are picked up.

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This compact floor dispenser which is 61 in. high and only 13 in. square is a valuable sales aid for use inside your shop.

ALSO THIS YEAR:- Sales material for the CROMPTON 'NEWSHAPE' LAMP

1. SHOWCARD. Clean, bright and attractive. Use it to draw attention to this very popular lamp.

2. LEAFLETS. Keep them near showcard; they are powerful selling aids.

Note. Crompton 'Newshape' has the same internal construction as 'Life-light': It is thus as much in advance of other lamps with this new bulb as 'Life-light' is in advance of other lamps of the ordinary shape.

1

2

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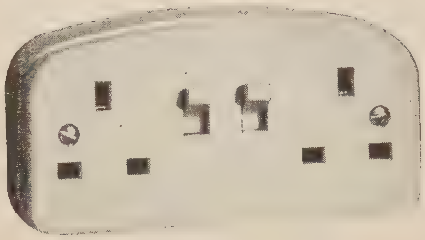

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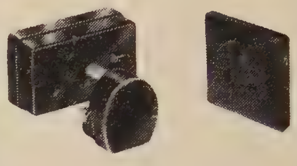

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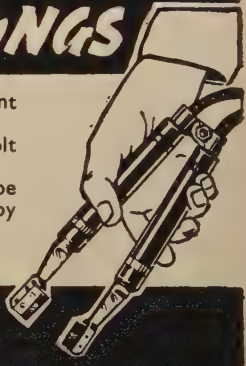

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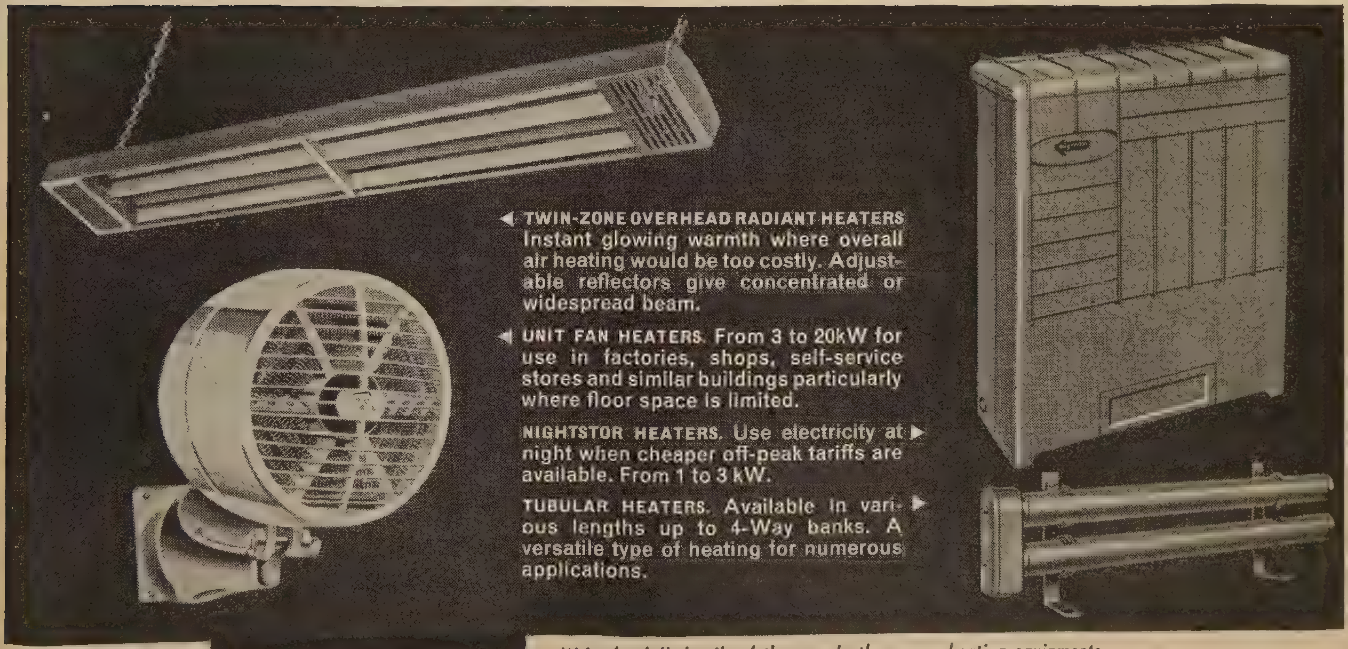

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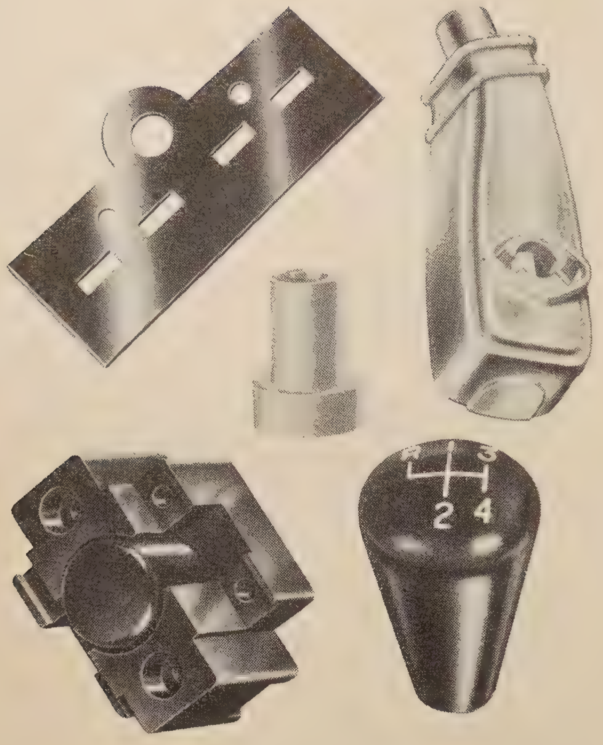

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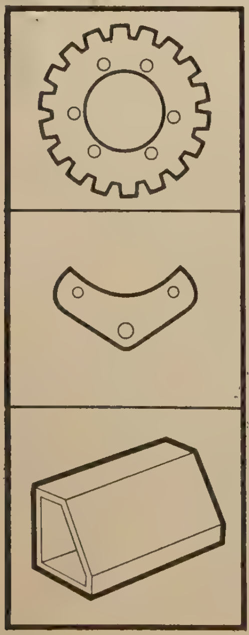

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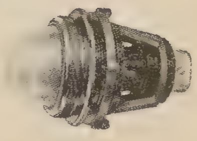

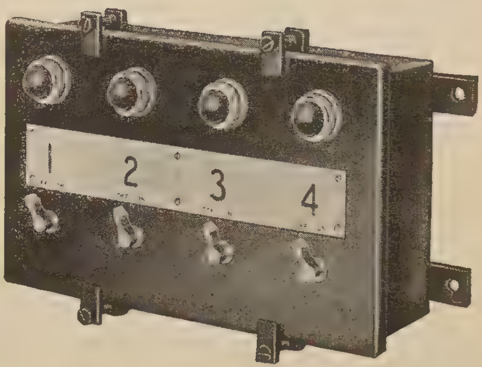

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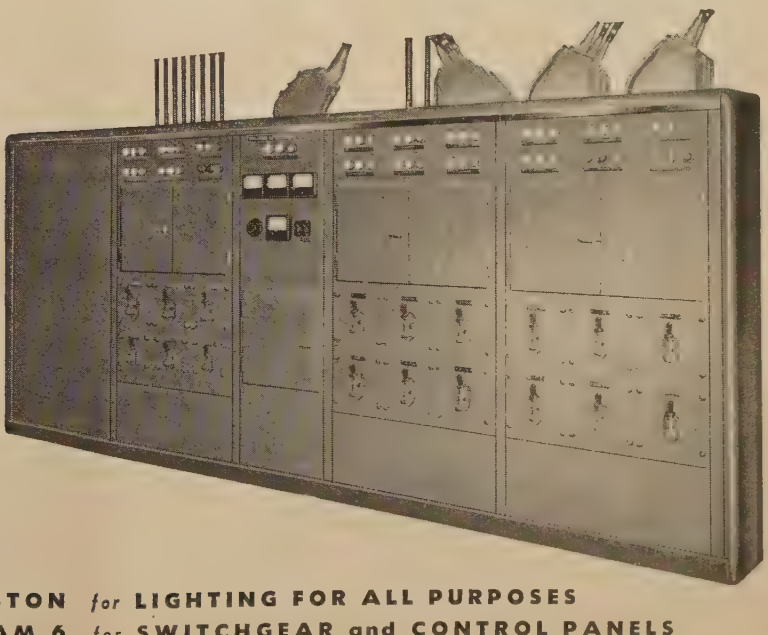

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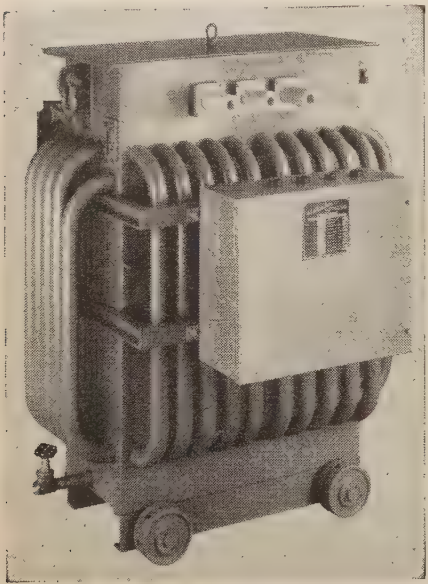

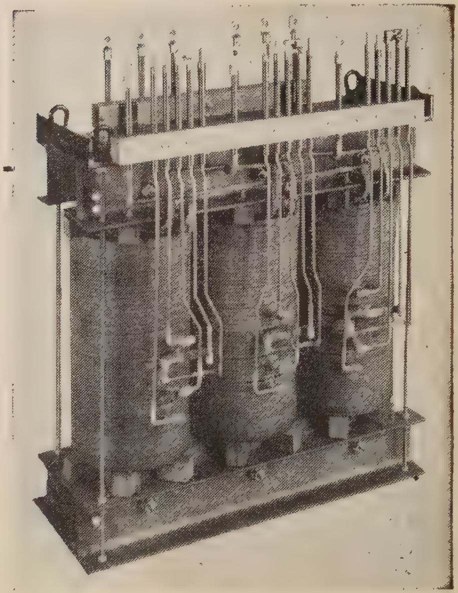

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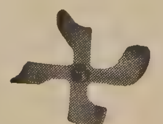

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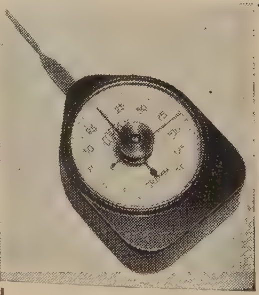

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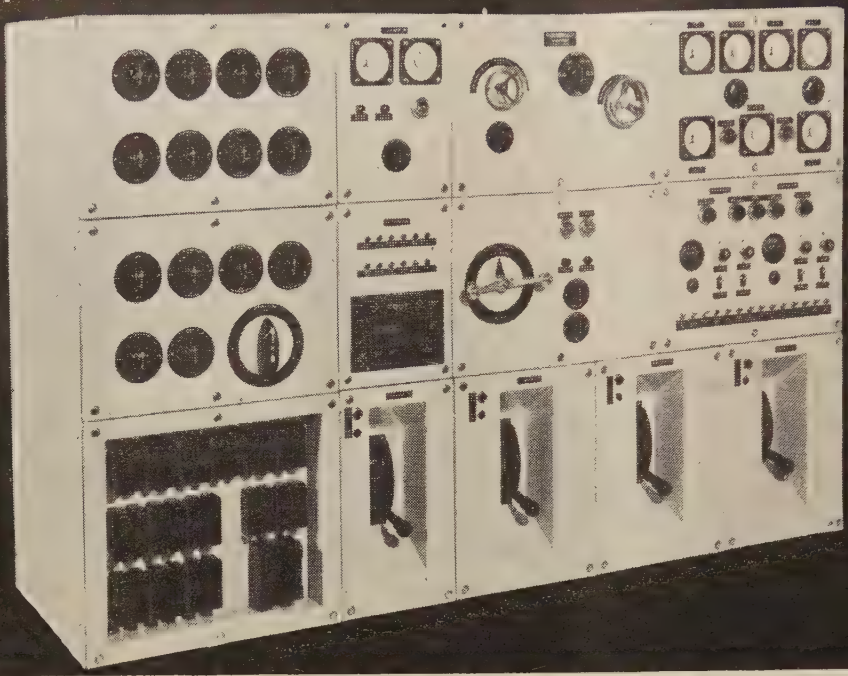

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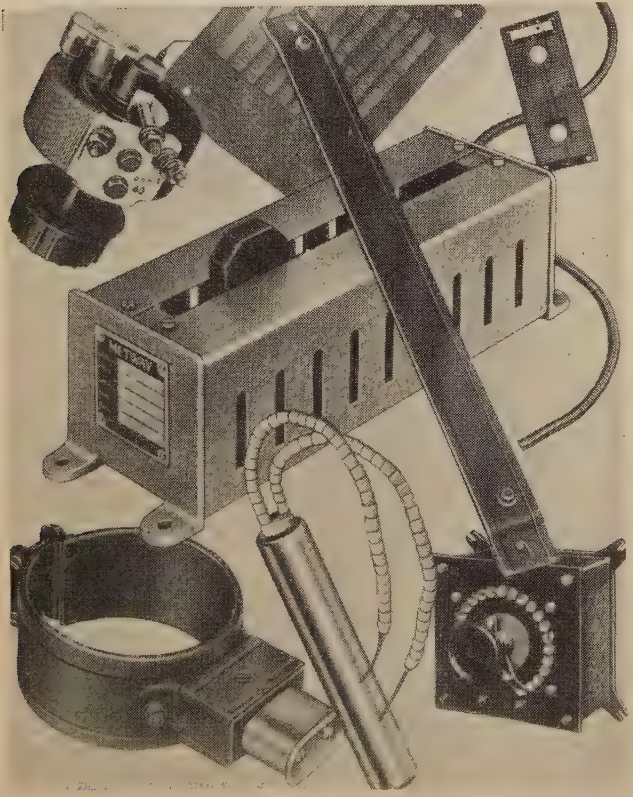

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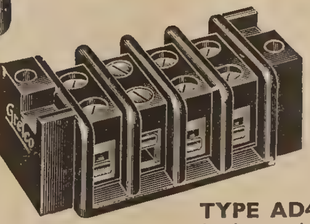

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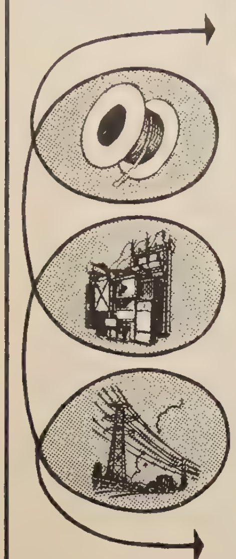

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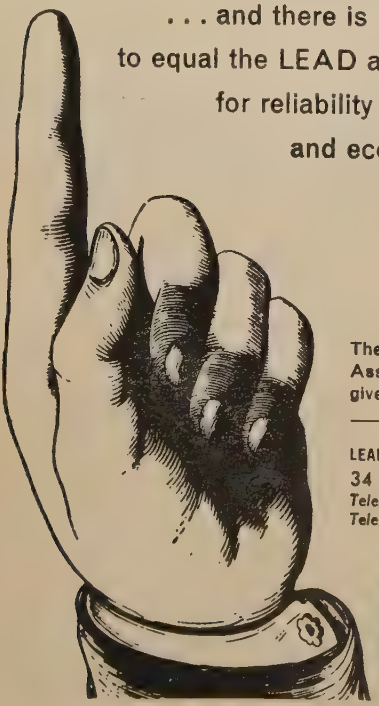

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15-WAY ROTARY SWITCH

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THE SWITCH for Transformer Tapping Control

15 amp — 30 amp
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In power stations and substations, on transmission lines and switchgear, the familiar "chocolate soldiers" form part of each characteristic skyline. They stand, sentinels of safety, examples of the combination of engineering know-how and the ancient craft of the potter, which give Taylor Tunnicliff a wealth of background experience unsurpassed in this specialised industry.

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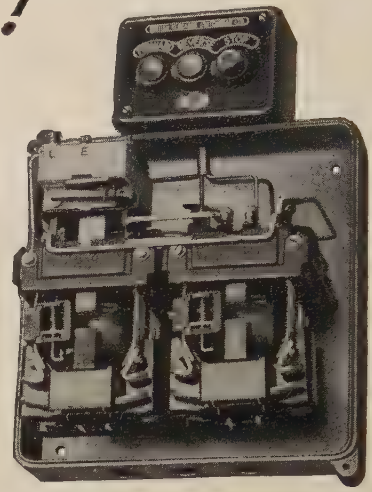

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Head Office and Works: **CHERTSEY, SURREY.** Tel: Chertsey 3467. Grams: Switchgear Chertsey.

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FIRM ....
ADDRESS .... R 36/37

Sheen
UNSPILLABLE
Compound
Buckets

This design helps to prevent Cable Jointers from being burnt with compound splashes and prevents contamination of the compound by rain or dust. The flange lid is easily locked or removed.

UNSPILLABLE
Note that there are no springs to become clogged and all handles are well clear of heat.

GAS FURNACES

A complete range is produced to meet all requirements of Local Authorities and Main Contractors. Sound design and robust construction.

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SHEEN
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SHEEN RECOMMEND **PROPAGAS**
AS SUPPLIED BY
SHELL-MEX AND
B.P. GASES LIMITED
Cecil Chambers, 86 Strand, London, W.C.2.

OVER 60 YEARS OF CABLE MAKING

Specialist Manufacturers of

FLEXIBLE CABLES & CORDS

to B.S.S., G.D.E.S., etc., specifications

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EST 1895

Lighting, Power, Dynamo, Lifts, Welding and Trailing, V.I.R. and T.R.S., Asbestos and Flame-Resisting, Enamel, Silk, Cotton and Glass Insulated Wires, Bare Copper Braids, Non-Rubber Flexibles, Plaited Copper Braids and Cords, P.V.C.-Polythene, P.V.C.-Microphone, Screened, Armoured, etc.

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Contractors to the Admiralty, War Office and Air Ministry, etc.
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"GREENWICH" CABLES AND FLEXIBLES

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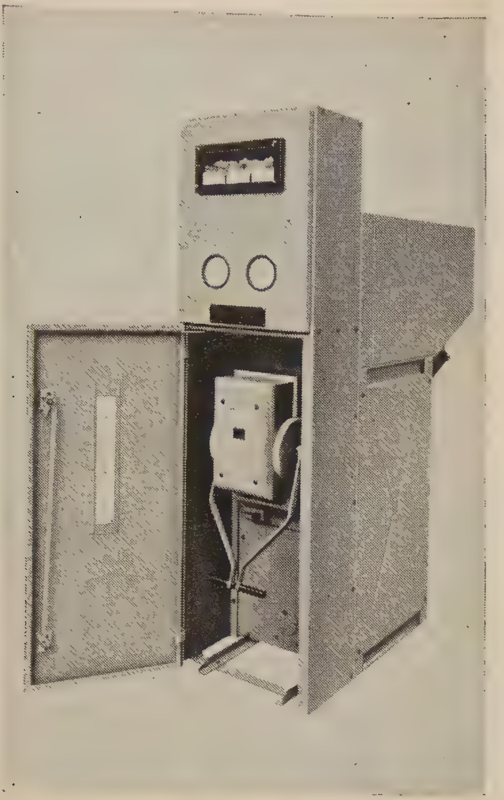
CATHODIC PROTECTION EQUIPMENT

rectifiers transformers
all-purpose control panels

ANODES of all types and sizes

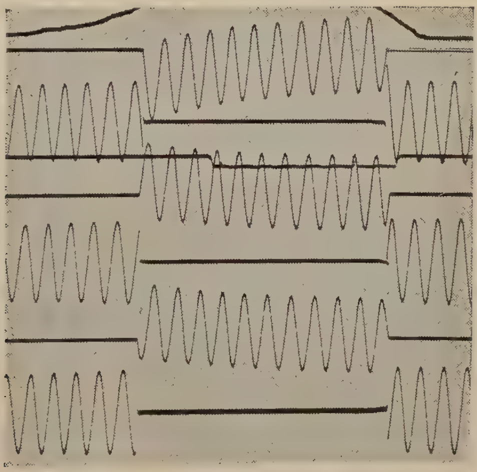
FOR pipelines, quays, tanks, process plants, heat exchangers, pumps, etc.

THE CUMBERLAND ENGINEERING CO. LTD.
Cathodic Protection Engineers since 1912
GRIMSHAW WORKS - DERBY ROAD - BOOTLE 20 - LANCS



Testing plays a larger part in the development of switchgear than of most plant. And it is not a matter of subjecting a circuit-breaker to a heavy overload to see whether it blows up. On the contrary, to the non-specialist observer a test is an almost ludicrous anti-climax. The build-up is impressive; long preparation, elaborate fire precautions, the switchgear itself as distant as the target in a rifle range and watched through armoured glass. A warning hooter clears the site. Then the test engineer presses a control switch . . . in complete silence absolutely nothing happens, and the test—another 'shot'—is over. But a battery of oscillographs has recorded on photographic film a complete history of everything of importance that happened inside the switch. This is one approach to . . .

This thing called know-how



Any new design or improvement of an existing one involves many such tests of numerous detailed innovations. They are the means by which the designer checks his work as it proceeds. Ready access to test facilities is thus an essential of his work. We are fortunate in having at Chelmsford one of the most up-to-date (ASTA) testing stations in the country, and this has played a most important part in the evolution of all our switchgear. But there is another side to know-how which comes from sheer experience—and we have had 80 years of that.

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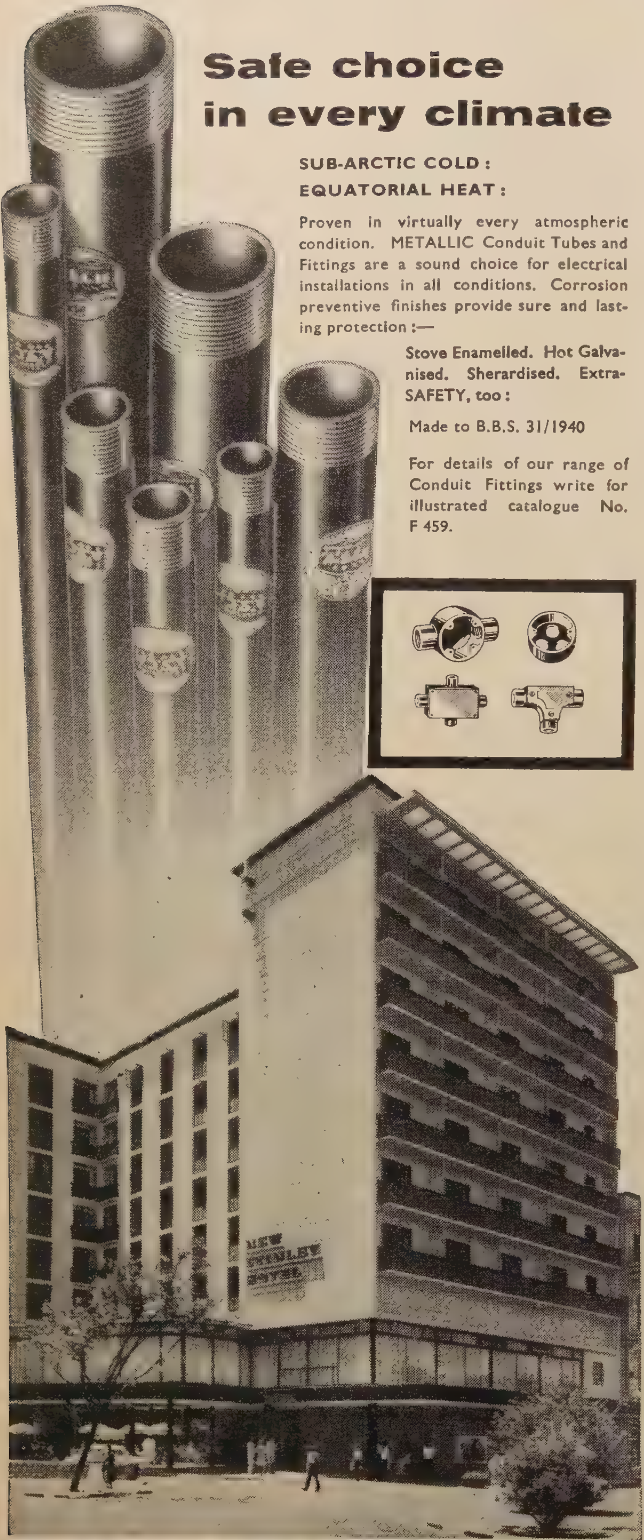
OWNERS OF AN APPROVED ASTA TESTING STATION

Makers of Electric Motors of all kinds, A.C. and D.C. Generators, B.E.T. Transformers, Switchgear, Cables, Instruments, Lamps, Lighting Equipment, Batteries, Stud Welding Equipment, Traction Equipment, Ceiling Fans.

CROMPTON PARKINSON LTD., CROMPTON HOUSE, ALDWYCH, LONDON, W.C.2.

S611



Safe choice in every climate

SUB-ARCTIC COLD:
EQUATORIAL HEAT:

Proven in virtually every atmospheric condition. METALLIC Conduit Tubes and Fittings are a sound choice for electrical installations in all conditions. Corrosion preventive finishes provide sure and lasting protection:—

Stove Enamelled. Hot Galvanised. Sherardised. Extra-SAFETY, too:

Made to B.B.S. 31/1940

For details of our range of Conduit Fittings write for illustrated catalogue No. F 459.

A TI COMPANY **METALLIC** CONDUIT & FITTINGS

THE METALLIC SEAMLESS TUBE CO. LTD.
Ludgate Hill, Birmingham, 3.
Also:
London, Newcastle-on-Tyne, Leeds, Swansea and Glasgow

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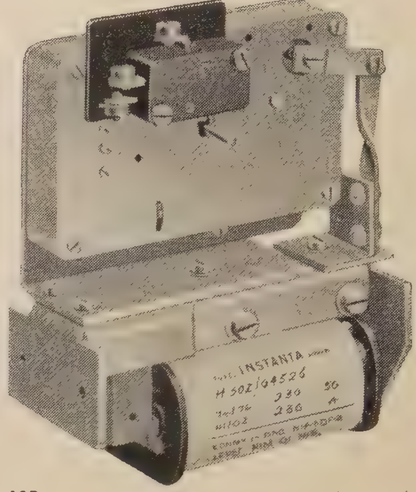
ESCAPEMENT TIME DELAY RELAYS



TYPE R.103
Ranges: 0/1, 0/10, 0/30, 0/60, 0/120 and 0/300 seconds

Slow to operate or slow to release models for all standard AC and DC supplies.

Time adjustable by calibrated dial.

Send for list 31059

MAGNETIC CONTROLS LTD.
4 Station Road, MAIDSTONE, Kent
Tel: 51485 Instanta Works, Upper Stone Street, Maidstone

CABLES ENCLOSED THROUGHOUT.
BENCH, WALL or CONDUIT BASE
FOR ALL TYPES OF
Industrial local lighting

INVISAFLEX

From ELECTRICITY SERVICES
6 Laurence Pountney Hill, London, E.C.4.

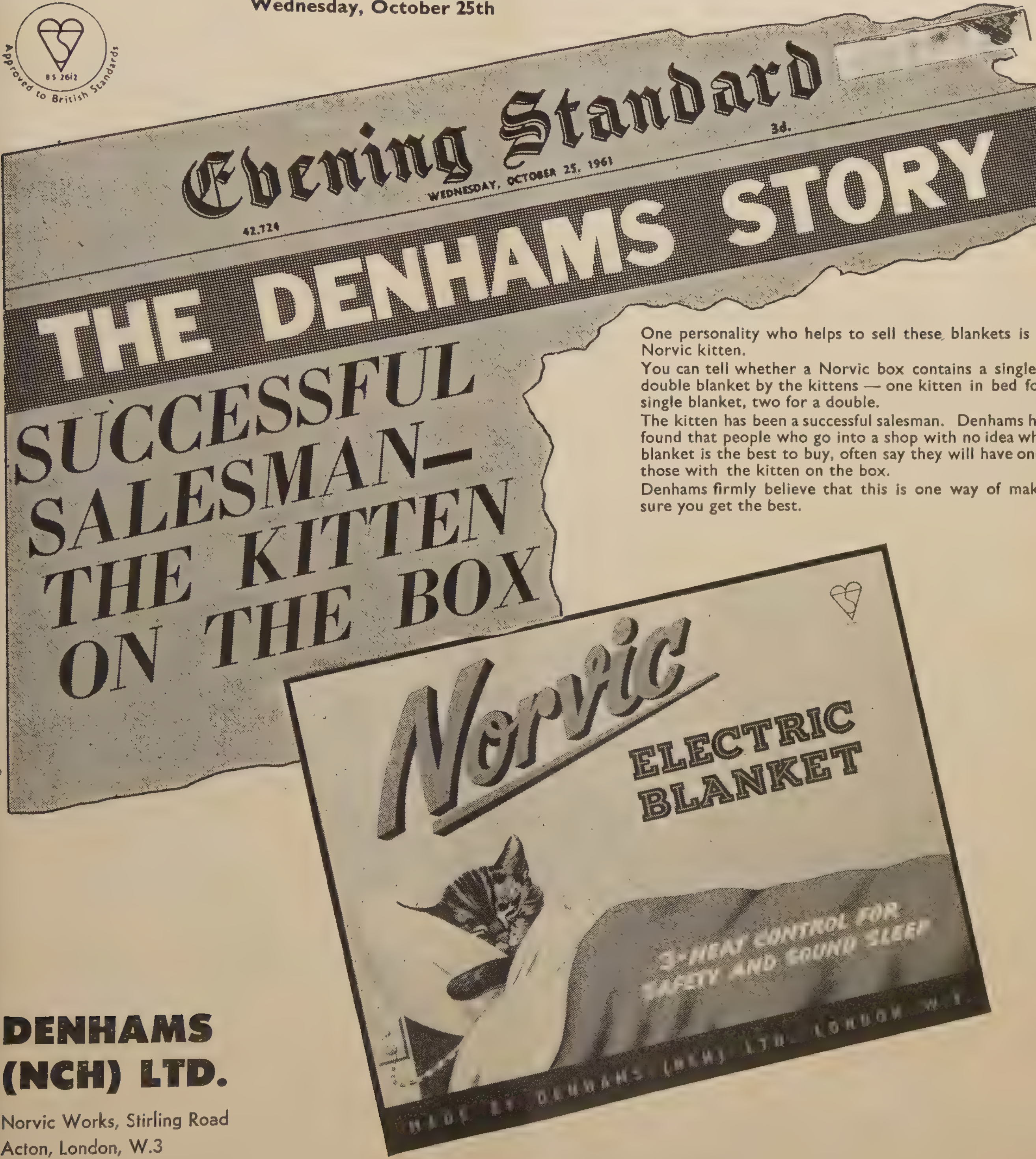
GOODNIGHTS begin with...

Norvic ELECTRIC BLANKETS

USED THE WORLD OVER

Approved to British Standards
BS 2612

The following is extracted from the issue of
Wednesday, October 25th



Evening Standard
42,724
WEDNESDAY, OCTOBER 25, 1961
3d.

THE DENHAMS STORY

SUCCESSFUL SALESMAN—THE KITTEN ON THE BOX

Norvic
ELECTRIC BLANKET
3-HEAT CONTROL FOR SAFETY AND SOUND SLEEP
MADE BY DENHAMS (NCH) LTD. LONDON W.3

One personality who helps to sell these blankets is the Norvic kitten.

You can tell whether a Norvic box contains a single or double blanket by the kittens — one kitten in bed for a single blanket, two for a double.

The kitten has been a successful salesman. Denhams have found that people who go into a shop with no idea which blanket is the best to buy, often say they will have one of those with the kitten on the box.

Denhams firmly believe that this is one way of making sure you get the best.

DENHAMS (NCH) LTD.

Norvic Works, Stirling Road
Acton, London, W.3
ACOrn 6527

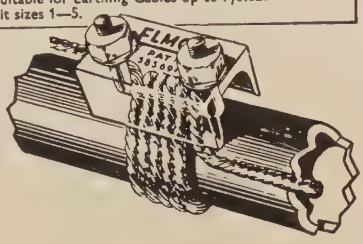
"ELMO"

EARTHING CLAMPS

A COMPLETE RANGE TO B.S.951. 1948

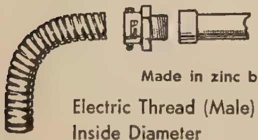
IN 4 SIZES	A123	B45	C67	D8910
for earthing cables up to	7/0.036"	7/0.064"	19/0.064"	19/0.083"
to fit B.S. conduit sizes	1, 2 & 3	4 & 5	6 & 7	8, 9 & 10
i.e. in trade terms	½" to ¾"	1" and 1¼"	1½" and 2"	2¼" to 3½"

NOTE ALSO: Type A123 is suitable for Earthing Cables up to 7/0.029" and for B.S. conduit sizes 1—5.



"Elmo" Earthing Clamps are of robust construction. Impossible for wire to pull out, always under tension, therefore a most satisfactory earth and a permanent safeguard.

ELECTRICAL FITTINGS

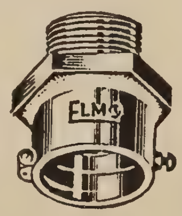


Flexible-to-rigid

CONDUIT COUPLINGS

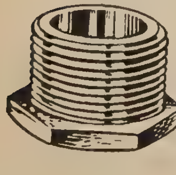
Made in zinc base alloy in the following sizes:

Electric Thread (Male)	⅝" ¾" 1" 1¼" 1½" 2"
Inside Diameter	⅝" ¾" 1" 1¼" 1½" 2"
Electric Thread (Male)	⅝" ¾" 1" 1¼"
Inside Diameter Flexible Conduit	½" ⅝" ¾" 1"



WITH EARTHING TERMINAL

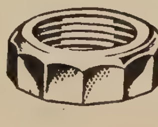
Special Features: Integral Earthing Terminal, tinned ready for soldering. Fixing screw for continuity. Internal Threads suit all makes of flexible tubing.



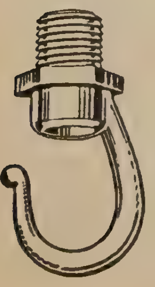
MALE
Hex. Section

CONDUIT BUSHES

Made in the following sizes:
MALE: Electric Thread
⅝" ¾" 1" 1¼" 1½" 2"
FEMALE: Electric Thread
⅝" ¾" 1" 1¼" 1½" 2"



FEMALE
Flat Face Section for Spanner (except ¾" size which is round)

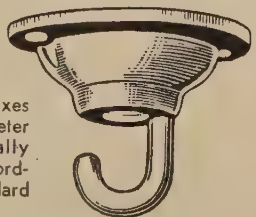


CONDUIT HOOK

For fluorescent lamps and overhead lighting fittings. Screwed ¾" thread, male electric. Made to fit all standard boxes with two holes 7/32" diameter —2" centres diametrically opposed. Designed in accordance with British Standard Specification.

CEILING PLATE

One hook



Manufactured by M. MOLE & SON LTD.
BIRMINGHAM · 3 · ENGLAND Est. 1835

ADCOLA PRODUCTS LIMITED (Regd. Trade Mark) SOLDERING EQUIPMENT

HIGHEST ELECTRICAL STANDARDS COMPLIED WITH

Illustrated

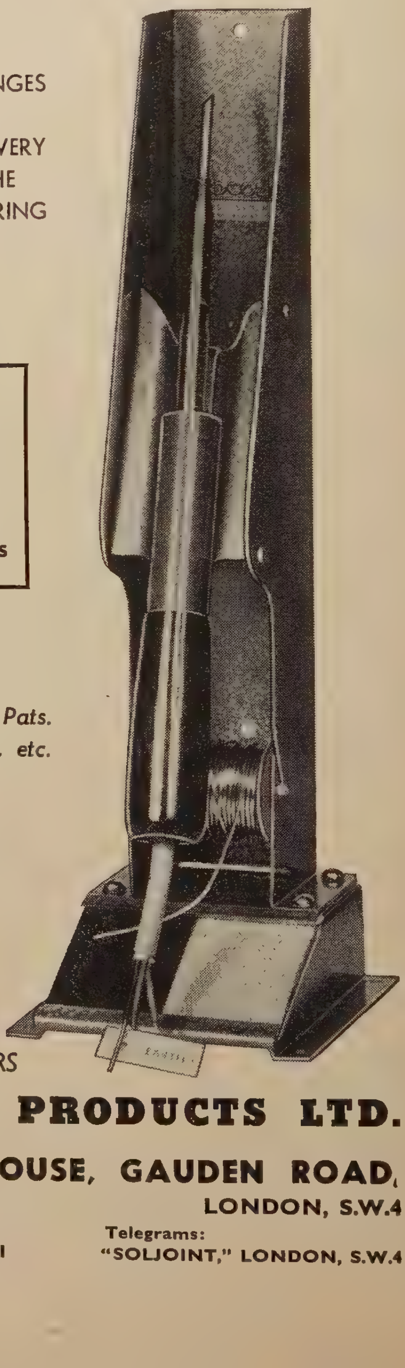
LIST No. 70 ⅛" BIT POSITIONED IN THE ADCOLA COMBINED PROTECTIVE SHIELD LIST 700

FOR CONTINUOUS BENCH LINE PRODUCTION

SUPPLIED
IN ALL VOLT RANGES
AND
A DESIGN FOR EVERY
PURPOSE IN THE
MINIATURE SOLDERING
INDUSTRY

The instruments with the correct soldering temperatures

British and Foreign Pats. Registered designs, etc.



APPLY FULL PARTICULARS

ADCOLA PRODUCTS LTD.
HEAD OFFICE
ADCOLA HOUSE, GAUDEN ROAD,
LONDON, S.W.4

Telephones:
MACaulay 4272 & 3101

Telegrams:
"SOLJOINT," LONDON, S.W.4

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CLASSIFIED advertisements are PREPAID at 4/- per line (approx. 6 words).

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Where an advertisement includes a Box Number there is an additional charge of 1/-.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

Remittances payable to "ELECTRICAL REVIEW."

REPLIES TO BOX NUMBERS should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1. If an applicant for a situation appearing under a Box Number does not wish his reply to be forwarded to a particular firm or individual, instructions to this effect should be addressed to the Advertisement Supervisor, ELECTRICAL REVIEW. The name of an advertiser using a Box Number cannot be disclosed.

OFFICIAL NOTICES, TENDERS, ETC.

AIR MINISTRY

EXHIBITION

Showing World-wide activities of the Directorate General of Works for the Royal Air Force and Ministry of Aviation.

Civil Engineering, Mechanical and Electrical Engineering, Architecture, Quantity Surveying, Heating and Ventilating, Estates and Land Management.

Plant, Models, Photographs and Drawings.

Tuesday, 9th January to Saturday, 13th January, 10.30 a.m. to 6.30 p.m., at AIR MINISTRY, WHITEHALL, LONDON, S.W.1.

Admission free.

275

INDIA STORE DEPARTMENT

THE Office of the Directorate General of Supplies and Disposals, N.I.C. Buildings, Parliament Street, New Delhi, India, invites tenders for the following:—

D.G.S. & D. TENDER ENQUIRY
No. PROJECT/SE/1626-M/1.

For the supply of 25-MVA Synchronous Condenser with Control Gear for the Rourkala Substation.

Specifications, etc., relative to the above enquiry can only be obtained from the office of the Directorate General of Supplies and Disposals, N.I.C. Buildings, Parliament Street, New Delhi, India, on payment of £6 7s. 6d. per tender document. The cost of the tender document is not refundable.

Tenders are to be returned direct to the Directorate General of Supplies and Disposals, at the above address, so as to reach them by 10 a.m. on 28th December, 1961. Your tender shall remain open for acceptance till 29th March, 1962.

Only the manufacturers (including their constituents or associates authorised to commit them) or their accredited agents who are in a position to supply the requirements from their own or their principal's manufactures are invited to quote.

Specimen copy of the above enquiry can be seen at India Store Department, Engineering Branch, Bromyard Avenue, Acton, London, W.3, under reference No. S.3484/61/NSC/ENG.2.

3076

URBAN DISTRICT COUNCIL OF BRAINTREE AND BOCKING

Street Lighting, Group B, Stage IV

TENDERS are invited on a FIXED PRICE basis (that is, without cost variation clauses for labour and materials) from contractors experienced in the type of work for:—

1. Taking delivery and erection of 81 Group B Prestressed Concrete Columns.
2. Supply, erection and wiring up of 78 45/60-watt Sodium Lanterns.
3. Supply, erection and wiring up of 4 Fluorescent Lanterns.
4. The laying of cable ducts across carriageways.
5. Removal of existing installations and incidental works.

Plans, conditions of contract and other documents may be inspected at the office of the Engineer, Town Hall, Braintree, who will also supply specifications, bills of quantities and tender forms upon payment of a deposit of £2 2s., which will be refunded upon the receipt of a bona fide tender and all documents.

Tenders, in the plain sealed envelope provided, endorsed "Tenders, Street Lighting," must be delivered to the Clerk of the Council, Town Hall, Braintree, before 12 noon on Friday, the 29th December, 1961. Specifications and priced bills of quantities must be returned at the same time in sealed envelopes bearing the tenderer's name and address.

The Council do not bind themselves to accept the lowest or any tender.

W. BALSON.
Clerk of the Council.

Town Hall,
Braintree, Essex.

3053

INDIA STORE DEPARTMENT

THE Director General, India Store Department, Government Building, Bromyard Avenue, Acton, London, W.3, invites tenders for the supply of:—

VARIOUS TYPES OF AIR MINISTRY AIRCRAFT CABLES

Only the manufacturers (including their constituents or associates authorised to commit them) or their accredited agents who are in a position to supply the requirements from their own or their principal's manufactures are invited to quote.

TENDERS ARE INVITED FROM A.I.D. APPROVED MANUFACTURERS ONLY.

Terms of tender, which are returnable on Monday, 1st January, 1962, may be purchased from C.D.N. Section at the above address at a cost of 10s., which is not returnable.

In your application for tender forms please quote Reference No. 1729/61/ENG.1.

3102

CLASSIFIED ADVERTISEMENTS
ARE PREPAID

Advertisements are accepted up to **first post on Monday** of the week of issue

If blocks, bold type or ruled borders are required then on **Friday** prior to week of issue

All communications to be addressed to:
Classified Advertisement Department,
ELECTRICAL REVIEW
Dorset House, Stamford Street
London, S.E.1

Original testimonials should not be sent with applications for employment

---

BOROUGH OF EALING

Renewal of Electrical Installations at Selborne Primary and Secondary School, Conway Crescent, Greenford, Middlesex

TENDERS are invited from approved N.I.C.E.C. contractors for the above-mentioned work.

Specification and tenders from the Borough Engineer, Town Hall, Ealing, London, W.5, on receipt of deposit of £1, returnable on receipt of a bona fide tender.

Closing date 27th December, 1961.

E. J. COPE BROWN,
Town Clerk.

3062

SITUATIONS VACANT

(See "Replies to Box Numbers" above)

Eastern Electricity

Norfolk Sub-Area

KING'S LYNN AND WESTERN DISTRICT
(245/61.R)

SENIOR COMMERCIAL ASSISTANT.

The position will call for the activities of a man with considerable experience in the successful organisation of a sales force operating in showrooms and outside as sales representatives. Ability and experience in the planning and operation of intensive integrated sales campaigns, exhibitions and demonstrations in addition to the operating of large and small showrooms is a necessary qualification. The development potential of the District is high, but the competition is also intensive, and the position is therefore one of importance and challenge.

Salary N.J.C. Grade 5, £1,020-£1,140 per annum. The commencing salary will be dependent on previous experience.

Apply by letter to the Manager, King's Lynn and Western District, Eastern Electricity, Gaywood Bridge, Wootton Road, King's Lynn, Norfolk, by 8th December, 1961.

Northmet Sub-Area
(246/61.R)

GENERAL ASSISTANT ENGINEER,
METER TESTING STATION,
Friern Barnet Road, London, N.14
(Ref. 1094).

Candidates should have a good general and technical education. A knowledge of the repair, testing and commissioning of meters and metering equipment for domestic and industrial supplies will be an advantage.

Salary N.J.B. Class N, Grade 16, £940-£1,065 per annum, including London allowance.

Apply by letter to the Manager, Eastern Electricity, Northmet Sub-Area, Northmet House, Southgate, London, N.14, by 15th December, 1961.

3091

Situations Vacant (continued)

AIR MINISTRY WORKS DEPARTMENT

invites applications for positions as STATION ENGINEERS Grade III at R.A.F. and Ministry of Aviation establishments throughout the United Kingdom to supervise the installation, operation and maintenance of electrical and/or mechanical plant.

SALARY, which is dependent upon age, quals. and exp., ranges in the U.K. from £801 (National rate) at age 25 to £988 max. in Grade III.

QUALS. and EXP. Applicants, who must be natural-born British subjects up to age 35, should have served an apprenticeship and should hold an O.N.C. or C. & G. Technical Cert. or 2nd Class M. of T. Cert. or equiv. Experience is required in one or more of the following:—

Electrical generation.
Electrical distribution, H.T. and L.T.
Electrical installations, industrial & domestic.
Light current and/or electronic engineering.
Ventilation and air conditioning.
Heating and hot water supply.
Compressed gases and refrigeration.
Bulk fuel installation.
Diesel engine-driven plant.

Internal training courses provided and financial assistance and time off may be allowed for recognised courses of study leading to higher qualifications.

PROSPECTS. Appointments are non-pensionable but retirement/resignation gratuity payable after 5 years' or more service. Excellent opportunities of obtaining permanent pensionable posts (with all service counting) and of advancement to the higher grades in which posts number 480 approx.

Higher grade salaries vary between £988 and £1,747 p.a. (National rate) and vacancies are, as a rule, filled by promotion of serving staff. Opportunities for overseas tours for which special allowances ranging at present up to £1,800 p.a. are payable in addition to a higher salary. 5-day week with 26½ days' paid leave a year initially including public holidays.

Forms from Manager (PE.1), Ministry of Labour, Professional and Executive Register, Atlantic House, Farringdon Street, London, E.C.4. Candidates selected will normally be interviewed in London and certain expenses reimbursed. Only applicants selected for interview will be advised.

269

UNIVERSITY OF BIRMINGHAM

Senior Engineer

APPLICATIONS invited from suitably qualified electrical or mechanical engineers to fill this important and interesting post in this expanding university.

Salary Grade I, £1,250 to £1,850.

Further particulars and forms of application from the Chief Engineer, University of Birmingham, Edgbaston, Birmingham, 15, to be returned by Saturday, 9th December, 1961.

3001

BRITISH ENGINE BOILER & ELECTRICAL INSURANCE CO. LTD.

Longridge House, Manchester, 4

ELECTRICAL SURVEYORS required in England and Scotland. Permanent positions carrying progressive salary scale £825 to £1,225 with non-contributory pension. Candidates, aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E., and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience.

3061

You'll find room to expand with 'ENGLISH ELECTRIC'

Stafford

CONTROL SYSTEM DESIGNER

A vacancy exists for a Control System Designer to undertake the development of Closed Loop Control Systems of the most advanced type for Industrial Drives and Processes.

The minimum qualifications are an Honours Degree in Engineering Physics or Mathematics. The successful applicant will be joining a leading team engaged on a wide variety of complex Control System projects.

A minimum of two years Post Graduate experience in Control System Design is essential for this vacancy. However, we will be interested in considering applications from men of high ability without this experience for other positions on this type of work.

Full details of housing and removal assistance will be given at interview and applicants should write giving full particulars to the **Technical Staff Officer, Dept. G.P.S., English Electric House, Strand, W.C.2,** quoting reference number ER 1296S.

'ENGLISH ELECTRIC'

3069

SOUTH WALES ELECTRICITY BOARD

Assistant Engineer

APPLICATIONS are invited for the position of ASSISTANT ENGINEER in the Mid-Wales and North Monmouthshire District (Abergavenny) of the Monmouthshire and Mid-Wales Area.

Preference will be given to engineers possessing the Higher National Certificate in Electrical Engineering.

Salary N.J.B. Class E, Grade 9, Scale 5, £825/£940 per annum.

Applications stating age, present position, present salary, qualifications and experience should be addressed to W. E. Richardson, M.I.E.E., Manager, Monmouthshire and Mid-Wales Area, Llywelyn Road, Cwmbran, Mon., to arrive not later than 16th December, 1961.

Please quote reference 145/61/ER, endorsing envelope "Assistant Engineer."

R. G. WILLIAMS,
Secretary.

3100

LONDON ELECTRICITY BOARD

Assistant Distribution Engineer

APPLICATIONS are invited for the above position in the Board's North Western District at Lithos Road, Hampstead, London, N.W.3.

Applicants should have a sound technical education to the standard of the Higher National Certificate and possess practical experience of all branches of engineering work associated with the organisation of a District distribution department.

The post is graded under Schedule A of the National Joint Board Agreement as Class H, Grade 9, i.e., £1,090 per annum, rising to £1,215 per annum, inclusive of London allowance.

Applications should be sent to the Manager, North Western District, Lithos Road, Hampstead, London, N.W.3, within fourteen days of the publication date of this notice. Please quote ref. PER/V/3453/R.

3094

ENGINEERING DESIGNER-DRAUGHTSMEN

required by

AIR MINISTRY IN LONDON

SALARY (inner London scale) Grade II, £1,048 to £1,215; Grade III, £658 to £1,048 (£866 at age 25); starting salary depends on age, quals. and exp.

Electrical Engineering Designer-Draughtsmen experienced in preparation schemes for illumination and electrical equipment of buildings or schemes for H.V. and M.V. electrical distribution. Some mechanical experience an advantage.

Candidates should have served recognised apprenticeship or had equiv. training and also adequate practical experience. Possession of recognised technical qualification an advantage; financial assistance and time off may be allowed for recognised courses of study for technical qualifications. 5-day week with 26½ days' paid leave p.a. initially, including public holidays. Promotion and pension prospects. Some overseas tours with special allowances in addition to salary.

Applicants, who must be natural-born British subjects, should write to AIR MINISTRY, W.G.d/(BH), LACON HOUSE, THEOBALDS ROAD, LONDON, W.C.1, giving age, details of training, quals., full particulars of former posts held, or apply to any Employment Exchange, quoting Kings Cross O/N.2254. Candidates selected will normally be interviewed in London and certain expenses reimbursed.

271

ESTABLISHED ELECTRICAL DISTRIBUTORS AND WHOLESALERS MANUFACTURING AND IMPORTING DIRECT ARE PREPARED TO INTERVIEW AS REPRESENTATIVES MEN WITH ESTABLISHED CONNECTIONS IN THE ELECTRICAL TRADE FOR POSTS IN A COMPANY WITH RAPIDLY EXPANDING SALES.

ALL ENQUIRIES TREATED IN CONFIDENCE.

WRITE GIVING FULL DETAILS—BOX 2913.

NORTH WESTERN ELECTRICITY BOARD

Senior Assistant (General Accountancy), Sub-Area Accountancy Dept., Bolton

The duties will include organisation and methods, supervision of the cashier's section, including payment of invoices, and the organisation and supervision of accounting and billing machines.

The possession of a professional accountancy qualification will be an advantage.

Salary scale £1,150 × £30 to £1,240 p.a., Grade 6. N.J.C. conditions.

Fourth Assistant District Commercial Engineer (Technical Sales and Service), Bury District

The successful applicant will be required to assist the Technical Sales and Service Engineer in connection with industrial and commercial tariff matters. The duties will include the preparation of space heating schemes and the giving of advice to consumers on the most efficient and economical utilisation of electricity. Technical qualifications to H.N.C. standard desirable.

Salary scale £765/£870 p.a., Grade H.13. N.J.B. conditions.

Draughtsmen/Draughtswomen (Recording), Bury District

Applicants should be capable of taking measurements on site whilst work on laying mains is in progress and be able to plot such mains on large-scale ordnance maps, together with such technical information as may be required.

Salary scale £600 × £25 to £700 p.a., Grade 1. N.J.C. conditions.

Applications on forms to be obtained from the Manager, No. 2 Sub-Area, North Western Electricity Board, 2, St. George's Road, Bolton, and returned to him by 16th December, 1961.

Draughtsman/Draughtswoman (Recording), Bolton District

Applicants should be capable of entering mains records on ordnance sheets and making scale measurements.

Salary scale £225/£640 p.a. N.J.C. conditions.

Applications to the Manager, at the address above, by 16th December, 1961.

Fourth Assistant Engineer (Senior Draughtsman), Sub-Area Engineering Dept., Oldham

Applicants should be experienced in the layout of 11-kV and 33-kV substations, substation design and protective gear diagrams as applied to high-voltage switchgear and transformers.

Salary scale £965/£1,090 p.a., Grade L.13. N.J.B. conditions.

Applications on forms to be obtained from the Manager, No. 3 Sub-Area, North Western Electricity Board, Union Street, Oldham, and returned to him by 16th December, 1961.

Principal Assistant, Sub-Area Secretarial Dept., Kendal

Applicants should be capable of assisting the Sub-Area Secretary in all aspects of the department's work and be well acquainted with modern administrative methods and procedures.

Experience of personnel work, wayleave and property records and the administration of non-operational properties is desirable, and a knowledge of legal provisions affecting the industry. An appropriate professional qualification would be an advantage.

Salary scale £1,380 × £40 to £1,500 p.a., Grade 8. N.J.C. conditions.

Applications on forms to be obtained from the Manager, No. 6 Sub-Area, North Western Electricity Board, Castle Green, Kendal, and returned to him by 16th December, 1961.

3065

N.I.R.N.S. NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE

have vacancies at the

RUTHERFORD
HIGH ENERGY LABORATORY
HARWELL, BERKS.

ELECTRICAL DESIGN STAFF

are required for the development of circuits and the specification of plant and equipment associated with particle accelerators. The work covers a wide technical field and involves close liaison with scientific staff developing a variety of experimental apparatus. A sound basic training in electrical engineering is required but previous experience of nuclear work is not essential for these posts :—

ASSISTANT DESIGN ENGINEER

with good experience of electrical design work. A knowledge of modern techniques concerning control and instrumentation would be an advantage. A Higher National Certificate in electrical or electronic engineering is required. The starting salary will be in the scale £1,065-£1,535 according to age and experience with annual increments to the maximum of the scale.

DRAUGHTSMEN

To work in an electrical design office on detailed drawing and layouts of a general nature. An appropriate Ordinary National Certificate together with a few years' workshop experience and some drawing office experience is required. The starting salary will be in the scale £650-£1,065 according to age and experience with annual increments to the maximum of the scale.

Opportunities occur for advancement to higher posts. There is a contributory superannuation scheme, transport facilities are available and assistance may be given with housing. Please send a post card for further details to :

personnel officer :

RUTHERFORD HIGH ENERGY LABORATORY, HARWELL

quoting reference number VN92/48

3077

L.C.C. HAMMERSMITH DAY COLLEGE
50, Brook Green, London, W.6
(Tel. RIV. 3618)

EXPERIENCED TRADESMAN required on four half-days per week (morning or afternoon) to instruct ELECTRICAL INSTALLATION apprentices and trainees in the theory and practice of the C.G.L.I. Course 51 A Syllabus.

Payment will be at the rate of £3 7s. 6d. (at present under review) per half-day of 3½ hours.

Apply to Principal, quoting FE.3a/R/3134/12.

3103

CROMPTON PARKINSON
(CHELMSFORD) LTD.

require a

SENIOR TEST ENGINEER

AN experienced man, conversant with the testing of medium sizes A.C. and D.C. machines, is required in our rotating machine test section.

Applications should be sent in confidence to Personnel Officer, Crompton Parkinson (Chelmsford) Ltd., Writtle Road, Chelmsford, Essex.

2972

Situations Vacant (continued)

Senior Assistant (Income)
(Z.1436)

Sub-Area Accountant's Department of No. 2 (Newbury) Sub-Area. Salary N.J.C. Grade 6 (£1,150-£1,240 per annum). N.J.C. conditions of service.

The duties of the post will be to assist the Principal Assistant in the supervision and control of a large electricity accounts billing section. It is essential that the person appointed will be capable, after being given suitable training, of programming and supervising the operation of a small electronic computer.

Assistant Engineer (Planning)
(Z.1424)

Melksham District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class G, Grade 9 (£965-£1,090 per annum). Present trends indicate that the District will be re-classified to Class H with effect from 1st April, 1962, salary £1,040-£1,165 per annum. N.J.B. conditions of service.

The duties of the post will be to assist the Planning Engineer in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks. Applicants should possess suitable technical qualifications.

Shift Engineer
(Z.1417)

Melksham District of No. 2 (Newbury) Sub-Area, located at Hawthorn (Quarry) Site, Corsham. Salary N.J.B. Class G, Grade 12 (£765-£870 per annum, plus a shift allowance at present £90 per annum). Present trends indicate that the District will be re-classified to Class H with effect from 1st April, 1962, salary £825-£940 per annum. N.J.B. conditions of service.

The duties of the post will include supervision of manual staff employed on the maintenance of H.V. and L.V. networks and plant, and to be responsible to the senior engineer for the operation and control of such networks and plant.

General Assistant Engineer
(Z.1444).

Newbury District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class G, Grades 14 and 13 (£670-£805 per annum). N.J.B. conditions of service.

The duties of the post will be to assist with distribution including minor construction work and general maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant, etc. Applicants should possess suitable technical qualifications.

Applications for these appointments on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks., and returned to him, quoting the appropriate "Z" number, not later than 11th December, 1961.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

3093

COUNTY BOROUGH OF NEWPORT MON.

BOROUGH ARCHITECT'S DEPARTMENT

requires

ASSISTANT ELECTRICAL ENGINEER

Grade A.P.T. III, £960-£1,140 per annum. A.M.I.E.E. Higher National or equivalent.

Five-day week. Approved removal expenses paid.

Further particulars and application forms from Borough Architect, Civic Centre, Newport, Mon.

3108

NUCLEAR CHEMICAL PLANT LIMITED

require an

ELECTRICAL DRAUGHTSMAN

to assist in the preparation of drawings and specifications for power distribution, lighting, motor control, process heating and electrical control systems for novel chemical plant installations.

The position would suit a young draughtsman who either holds or is progressing towards the National Certificate in Electrical Engineering and wishes to gain useful experience over a wide field of electrical applications.

Good salary and working conditions. Pension scheme.

Apply, giving brief details, to :—

NUCLEAR CHEMICAL PLANT LTD.
105-113, The Broadway
West Ealing, London, W.13

3066

DEVELOPMENT ENGINEER

The Company invites applications for the appointment of a Development Engineer at their Works at Enfield, Middlesex.

Applicants should have wide experience in the development of Domestic Electric Heating and Cooking Appliances, with good technical qualifications. An appropriate salary will, of course, be paid.

Please address your letter with full details to :

MR. C. R. BELLING, BELLING & CO. LTD.
BRIDGE WORKS, ENFIELD, MIDDLESEX

3078

YORKSHIRE ELECTRICITY BOARD

No. 3 (Sheffield) Sub-Area

FOURTH ASSISTANT ENGINEER
(System Standardisation).

Applicants should have had some experience in the installation and maintenance of domestic and small industrial electrical equipment, and in preparing estimates of the cost of this class of work.

The successful candidate will be employed in the Sub-Area System Standardisation Section of the Commercial Department.

Salary N.J.B. Class N, Grade 13 (Scale 9), £1,115/£1,245 per annum.

DEMONSTRATOR (Sheffield District)
(Two Posts).

Applicants should have successfully undertaken a recognised course of domestic subjects and preferably possess the certificate of the Electrical Association for Women.

They must have experience in cooking practice, demonstration of electrical appliances, and be capable of advising consumers on the use of electricity in the home.

The successful candidate will have to give public demonstrations. She will normally be located in Sheffield, but may be required to work throughout the Sub-Area as occasion demands; in addition, she will be required to assist in the normal activities of the service centre as the need arises.

The normal hours of duty average 38 hours per week, Monday to Saturday inclusive, with one Saturday in four off duty.

Salary N.J.C. Grade 1, £600/£25/£700 per annum.

Applications, together with the names of two referees, should be sent to the Manager, Yorkshire Electricity Board, No. 3 (Sheffield) Sub-Area, Change Alley, Sheffield, not later than 15th December, 1961.

No. 6 (Hull) Sub-Area

FOURTH ASSISTANT ENGINEER
(Meters, Testing and Protection).

Applicants should have had a good general and technical education with some experience in the electrical industry subsequent to technical training.

The duties will include commissioning, testing, maintenance and repair of metering and protection equipment, fault location and general electrical testing throughout the Sub-Area.

The work is varied and interesting and offers opportunities of gaining valuable experience.

Salary N.J.B. Class L, Grade 13 (Scale 7), £965/£1,090 per annum.

Applications, together with the names of two referees, should be sent to the Manager, Yorkshire Electricity Board, No. 6 (Hull) Sub-Area, Ferensway, Kingston-upon-Hull, not later than 15th December, 1961.

No. 1 (Bradford) Sub-Area

DEMONSTRATOR.

Candidates should have had domestic science training, including electrical housecraft, and should preferably hold the E.A.W. Certificate or Diploma. They should be competent to lecture and advise consumers on the utilisation of domestic electrical appliances and be able to give demonstrations with a sales emphasis. The successful applicant will be located at Bradford, but may be required to work throughout the Sub-Area if the occasion demands.

Salary N.J.C. Grade 1, £600/£25/£700 per annum.

Applications, together with the names of two referees, should be sent to the Manager, Yorkshire Electricity Board, No. 1 (Bradford) Sub-Area, 45/53, Sunbridge Road, Bradford, 1, not later than 15th December, 1961.

3099

ELECTRICAL INSULATION ENGINEER

A berth is available with a Company of excellent standing, with headquarters in Southern England, for an Insulation Engineer of wide knowledge and experience to work closely with Sales and Production Depts.

A knowledge of recent developments in the field of synthetic resins will be a big asset and an appreciation of market requirements is necessary.

Excellent terms will be offered to the right man.

Write in confidence to
Managing Director, Box No. 3054

UNIVERSITY OF NOTTINGHAM

Manager for Applied Science Faculty Workshops

APPLICATIONS are invited for the appointment of MANAGER of the newly established mechanical and electronics workshops for the production of scientific equipment for teaching and research. A staff of 50 workmen is planned.

Candidates should have served a recognised engineering apprenticeship and have corporate membership of a professional engineering institution.

Salary scale £1,475 to £1,850; initial salary according to qualifications and experience, plus membership of the Universities Superannuation Scheme and family allowance.

Application form and conditions of appointment to be returned by 31st December, 1961, from the Registrar.

3057

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division
(Vacancy No. 308/ER/61)

APPLICATIONS are invited for the appointment of MAINTENANCE ENGINEER (Mechanical) at Uskmouth "A" Power Station, West Nash, near Newport, Mon.

Salary Schedule A, Class K, Grade 5, Scale 14, £1,535-£1,720 per annum.

Applicants should have had mechanical maintenance experience in a large modern power station and should preferably be Corporate Members of the Institution of Mechanical Engineers or hold equivalent qualifications.

Special application forms are available from Establishments, Central Electricity Generating Board, South Wales Division, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 16th December, 1961.

3106

SOUTH EASTERN ELECTRICITY BOARD

CARTOGRAPHIC DRAUGHTSMAN, Eastbourne.

Salary £600 × £25 to £700 p.a. under N.J.C. Grade 1. Superannuable. Applicants should have had a good general education and experience in a distribution drawing office including the reproduction of ordnance maps, the preparation of plans and charts and the recording of mains on maps, etc.

Applications, quoting ER and naming 2 referees, to District Manager, SEEBOARD, Electric House, Grove Road, Eastbourne, by 13th December, 1961.

GEORGE WRAY,
Secretary.

3097

DRAUGHTSMEN

seeking scope for their initiative and ability will find interesting work at

FOSTER TRANSFORMERS LIMITED

The company's diverse range of products includes transformers of all types, voltage regulators and control equipment.

Apply to the

Personnel Officer
FOSTER TRANSFORMERS LTD.
Morden Road, South Wimbledon
London, S.W.19

A Company of the Metal Industries Group

3036

NORTH EAST METROPOLITAN REGIONAL HOSPITAL BOARD

ELECTRICAL ENGINEERS (Main Grade). Salary £950-£1,650. Applicants must be A.M.I.E.E. Graduate members eligible on scale up to £1,255.

ENGINEERING DRAUGHTSMEN. Three grades of appointment available according to experience with salaries ranging from £570-£1,300. 3 years' practical and theoretical training required for lowest grade; H.N.C. for highest.

STARTING SALARY FOR MOST POSTS depends on qualifications and experience. Superannuation scheme. Mileage payments for use of car. Staff restaurant.

APPLICATIONS giving age, qualifications, present salary and full details of experience, with dates, and names and addresses of two referees, to the Secretary, North East Metropolitan Regional Hospital Board, 40, Eastbourne Terrace, London, W.2, within fourteen days.

3070

SOUTH OF SCOTLAND ELECTRICITY BOARD

Stirling Area

THIRD ASSISTANT COMMERCIAL ENGINEER (Ref. 66/61) required for the Falkirk District of this Area.

Candidates should have had a sound practical training in electrical engineering and be experienced in the work of a commercial department of an electricity supply undertaking. The possession of a Higher National Certificate would be an advantage.

N.J.B. conditions. Salary Class G, Grade 9, £965/£1,090 per annum. Superannuable post.

Applications, on the standard form obtainable from the Manager, S.S.E.B., Woodlands, St. Ninians Road, Stirling, should be submitted not later than 13th December, 1961.

3096

Situations Vacant (continued)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts :—

Wolverhampton Area

SECOND ASSISTANT DISTRICT ENGINEER (Cannock).

Duties include the planning, construction, operation and maintenance of H.V. and M.V. mains and substations within the District, in which work applicants should preferably have had experience. Technical qualifications desirable. Salary £1,040/£1,165 per annum (N.J.B. Grade F.7).

Apply by letter within 14 days, stating age, experience, present position and salary, to Mr. D. Holt, Area Manager, Midlands Electricity Board, 83, Darlington Street, Wolverhampton.

Worcestershire Area

FOURTH ASSISTANT ENGINEER
(Shift Control)
(Control Centre, Area Office).

Duties will include assisting the Shift Engineer to carry out all functions associated with a high-voltage system control. Applicants should have had technical training together with experience of switching operations and maintenance work on H.V. distribution equipment. Salary £890/£1,015 per annum plus 10% shift allowance (N.J.B. Grade K.13).

Apply by letter within 14 days, stating age, experience, present position and salary, to Mr. R. Mallet, Area Manager, Midlands Electricity Board, P.O. Box 52, Blackpole Road, Worcester.

F. W. CATER,
Secretary.

3079

CENTRAL ELECTRICITY GENERATING BOARD

Western Division

Assistant Reactor Physicist required at Hinkley Point Nuclear Power Station, Bridgwater, Somerset

(W/AV/115/61)

SUPERANNUATION scheme. Salary N.J.B. Class O, Grade 7, Scale 16, £1,795-£1,950 per annum.

The work associated with this appointment concerns the interpretation of measurements made on the reactors to ensure their safe and efficient operation. There will be some routine work but the major task will be the anticipation and prevention of operational difficulties.

The successful candidate should preferably possess a degree in Physics or Mathematics and have a keen interest in the operational problems of nuclear power stations.

Adequate nuclear training will be given where necessary. Good sick pay and holiday schemes are in operation.

Applications on form A.E.6/ACT, obtainable from the Personnel Department, 26, Oakfield Road, Bristol, 8, should be completed and returned by Monday, 18th December, 1961.

3098

CENTRAL ELECTRICITY GENERATING BOARD

Southern Project Group

West Thurrock Power Station

APPLICATIONS are invited for the post of **THIRD ASSISTANT ENGINEER** (PLANNING AND PROGRESS) at West Thurrock Power Station Construction Site.

Applicants should be familiar with the problems relating to the planning and progressing of power station construction and have sufficient knowledge of the detailed construction and erection of power station plant to enable preparation of programmes and to report on the progress of plant erection at site.

Membership or qualifications leading to membership of a professional institution will be an advantage.

The salary will be within Scale 13 of the National Joint Board Agreement, i.e., £1,320 to £1,610 per annum according to qualifications and experience, plus £60 per annum London allowance.

Applications stating age, qualifications, experience, present position and salary should be forwarded to the Administrative Officer, Central Electricity Generating Board, Southern Project Group, Squires Lane, Finchley, London, N.3, to arrive not later than 11th December, 1961.

Envelopes should be marked "Confidential Ref. S/61/28."

T. YULE,
Chief Project Engineer.

3063

COUNTY BOROUGH OF BURTON UPON TRENT EDUCATION COMMITTEE

Technical College
Principal: E. White, M.Sc.(Econ.)

APPLICATIONS are invited for the post of GRADE B ASSISTANT in the Engineering Department. The teacher required should be qualified to take courses (i) in Electrical Installation and (ii) for Electrical Technicians.

Salary will be in accordance with the Burnham Technical Scale (at present £700-£1,150 per annum). Additions may be given for industrial experience after 21 years of age (up to £330 above the minimum), training and study (up to £120 above the maximum), qualifications (up to £165 above the maximum).

Forms of application, which may be obtained from the undersigned upon receipt of a stamped addressed foolscape envelope, should be sent as soon as possible to the Principal, The Technical College, Burton upon Trent.

A. H. BLAKE,
Director of Education.

Education Office,
Guild Street,
Burton upon Trent.

2987

NORTH WESTERN ELECTRICITY BOARD

Third Assistant Engineer,
Design and Planning Section,
Sub-Area Engineering Dept., Manchester

THE duties will include the preparation of schemes and estimates for extension of a large city network and associated protective gear. Experience of the design and planning of systems up to 33 kV will be an advantage. Applicants should have received a technical education to H.N.C. level or its equivalent, and preferably have served a recognised engineering apprenticeship.

Salary scale £1,275/£1,410 p.a., Grade M.10. N.J.B. conditions.

Applications on form to be obtained from the Manager (Staff Vacancy), No. 1 Sub-Area, North Western Electricity Board, Town Hall, Manchester, 2, P.O. Box 493, and returned to him by 11th December, 1961.

3090

DORSET COUNTY EDUCATION COMMITTEE

South Dorset Technical College

APPLICATIONS are invited for the post of ASSISTANT GRADE B in ELECTRICAL ENGINEERING, to commence on 1st January, 1962, or as soon as possible thereafter.

The candidate appointed will be required to teach Electrical Engineering subjects up to the standard of the Ordinary National Certificate in Electrical Engineering. Ability to teach Radio Service Work would be an advantage. Opportunity will be given to teach more advanced work according to the qualifications and experience of the person appointed.

Basic salary scale £700-£1,150 p.a. (under review).

Further particulars and forms of application may be obtained from the Principal, South Dorset Technical College, Newstead Road, Weymouth, to whom completed forms must be returned as soon as possible.

3083

W. H. ALLEN SONS & CO. LTD.

have a vacancy for a

SALES ESTIMATING AND CONTRACTS ENGINEER

in their

ELECTRICAL DEPARTMENT

Candidates should be between 24-35 years old and possess at least an H.N.C. in Electrical Engineering or equivalent. The work will cover proposals involving A.C. and D.C. generators and motors, switchgear and control gear for land and/or marine applications. Salary according to experience and qualifications.

Application forms, etc., can be obtained from :—

The Personnel Manager
(Ref. 507/2/3)
Queens Engineering Works
Bedford

3037

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Region

APPLICATIONS are invited from suitably qualified engineers for the following appointments in the Technical Branch of the Regional Electrical Department :—

1. One THIRD ASSISTANT ENGINEER (Protection), Grade 8, Class K (£1,145-£1,410 per annum), based on Leeds (Design Section), to undertake the checking of schematic diagrams, wiring diagrams and specifications for protective and control gear and associated apparatus. Site commissioning experience would be an advantage.

2. Two FOURTH ASSISTANT ENGINEERS (Protection), Grade 10 or 11, Class K (£980-£1,245 or £900-£1,165 per annum), based on Leeds (Design Section), to assist with the work described under Vacancy (1).

3. Three FOURTH ASSISTANT ENGINEERS (Protection), Grade 11, Class K (£900-£1,165 per annum), based on North Tees, Leeds and Rotherham, to assist with testing and commissioning of generators, transformers, switchgear, lines and cables and with the testing, commissioning and maintenance of protective gear and control and indicating equipment for switchgear and transformers.

In all cases experience in a switchgear manufacturer's works would be an advantage.

Forms of application may be obtained from the Regional Personnel Officer, Central Electricity Generating Board, North Eastern Region, 1, Whitehall Road, Leeds, 1, to whom they should be returned to arrive not later than 15th December, 1961.

3092

CITY OF BIRMINGHAM PUBLIC WORKS DEPARTMENT

Mechanical and Public Lighting Section

APPLICATIONS are invited for the following posts :—

(a) ELECTRICAL ENGINEER, Grade A.P.T. IV (£1,140/£1,310 p.a.)

(b) JUNIOR ENGINEER (Electrical), Grade A.P.T. I (£665/£835 p.a.).

Applicants for post (a) should be A.M.I.E.E or Dip.M.I.E.S. (with 5 years' experience), or hold the Higher National Certificate in Electrical Engineering (with 5 years' experience). They should have considerable experience in lighting engineering, particularly public lighting.

Applicants for post (b) should be Dip.M.I.E.S or have obtained joint part 1 of the examination of the Institution of Electrical Engineers. They should have experience in lighting engineering. Some experience in public lighting will be an advantage.

The posts are permanent, superannuable and subject to a medical examination.

Applications endorsed with the heading of the post applied for, stating qualifications, age and experience, and naming two referees, should reach the undersigned by the 9th December, 1961.

Canvassing disqualifies.

HERBERT J. MANZONI,
City Engineer and Surveyor.

Baskerville House,
Civic Centre,
Birmingham, 1.

3056

ARMATURE AND STATOR FOREMAN

required for repair shop in East London area. Must be fully experienced for motors up to 100 h.p. and over. Progressive position for person with organising ability. Incentive bonus and overtime.

Apply in writing to Box 3067, stating qualifications. Present staff notified.

Also vacancies for ARMATURE & STATOR WINDERS.

Mullard

MULLARD SOUTHAMPTON WORKS

SEMICONDUCTOR MEASUREMENTS AND APPLICATIONS LABORATORY

The Laboratory provides the technical background for the Mullard consultant service to all branches of industry on the application of semiconductor devices. These range from small signal transistors to power rectifiers and silicon controlled rectifiers with ratings of many hundreds of volts at high currents.

SENIOR AND JUNIOR ENGINEERS are required for projects concerned with THE APPLICATION OF POWER RECTIFIERS AND SILICON CONTROLLED RECTIFIERS

This work requires engineers capable of clear and logical thought in the solution of diverse problems such as heat transfer, series and parallel operation, speed and position control of motors, control circuits, using transistors, over-voltage and over-current protection.

The previous experience of applicants could be in either electrical or electronic engineering.

A well organised training scheme exists within the Laboratory, designed to give a comprehensive introduction to the use of semiconductor devices.

Please apply in writing to the Plant Personnel Officer, Mullard Southampton Works, Millbrook Industrial Estate, Southampton, quoting ref. C.29.

"Mullard" is the Trade Mark of Mullard Limited.

3089

HACKNEY TECHNICAL COLLEGE

Dalston Lane, London, E.8

APPLICATIONS are invited for the following appointments :—

I. LECTURER IN ELECTRICAL ENGINEERING to teach up to H.N.C. in Electrical Technology and either Electrical Power Supply or Electronics. The successful candidate will be required to assist in the general running and development of the electrical engineering laboratories.

Applicants should be university graduates in mechanical or electrical engineering and/or corporate members of the appropriate institution, and should have served an apprenticeship with subsequent industrial and/or teaching experience.

II. ASSISTANT LECTURER, GRADE B, in ELECTRICAL ENGINEERING, to teach O.N.C. subjects, with possibly some H.N.C. work. Candidates should hold at least an H.N.C. in Electrical Engineering or equivalent qualification and have had industrial and/or teaching experience.

Salary scale (subject to ratification): Lecturer £1,645-£1,860; Assistant Lecturer (Grade B) £815-£1,410, with additions for qualifications and training. Point of entry dependent on teaching and/or industrial experience.

The posts will involve both day and evening work.

Further particulars and application forms from the Secretary, returnable by 31st December, 1961.

3072

COUNTY COUNCIL OF NORTHUMBERLAND

County Architect's Department

Deputy Heating and Lighting Engineer

Lettered Scales Grade B, £1,485-£1,670 p.a.

APPLICATIONS are invited for the above appointment. Candidates must be suitably qualified in both electrical and heating installation work and be capable of designing large-scale electrical, heating and ventilating installations and have experience in the supervision of technical staff.

The commencing salary will be fixed in accordance with qualifications and previous experience. 5-day week. Car mileage allowance and lunch facilities are available. Grant towards cost of removal expenses will be made.

The appointment will be in accordance with the National Joint Council's conditions of service and the provisions of the Local Government Superannuation Acts.

Successful candidate will be required to pass a medical examination.

Application forms, which can be obtained from the undersigned, should be submitted not later than fourteen days from the date of this advertisement.

C. C. BROWN,
County Architect.

30/32, Great North Road,
Newcastle upon Tyne, 2.

3055

RESIDENT SALES ENGINEER for IRAN

OLD ESTABLISHED CONTINENTAL MANUFACTURERS OF ROTATING ELECTRICAL MACHINERY, REQUIRE SALES ENGINEER FOR TEHERAN OFFICE, FOLLOWING INSTRUCTION PERIOD AT WORKS.

LUCRATIVE POSITION WITH EXCELLENT PROSPECTS.

WRITE FOR PRELIMINARY INTERVIEW IN LONDON.

Box 3114

Situations Vacant (continued)

E C C

INTERNAL PROMOTION CREATES VACANCIES

for

SENIOR SALES ENGINEERS

in

(a) SCOTLAND
(b) NEWCASTLE-ON-TYNE AREA
(c) LANCASHIRE

for promoting sales of:—

ROTATING MACHINES
SWITCH AND CONTROL GEAR
RECTIFIERS AND TRANSFORMERS

Excellent prospects for the right applicant.

Apply in writing, giving full details of training and experience, to:—

(a) The Manager—Glasgow
The Electric Construction Co. Ltd.,
Bushbury House
5, Woodlands Terrace
Glasgow, C.3

(b) The Manager—Newcastle-on-Tyne
The Electric Construction Co. Ltd.,
Lloyds Bank Chambers
Westgate Road
Newcastle-on-Tyne, 4

(c) The Area Manager
The Electric Construction Co. Ltd.,
Bushbury House
435, Wilmslow Road, Withington
Manchester, 20

3064

OUTSIDE SALES ENGINEERS

BRUCE PEEBLES & Co. Limited, manufacturing electrical engineers, require Sales Engineers for their MANCHESTER, BIRMINGHAM and LEEDS offices.

Applicants must have served a recognised apprenticeship in electrical engineering, should be of Higher National Certificate standard technically, and have had inside sales experience. Preferred age group 25-35 years. The man for Birmingham office may be asked to live in the East Midlands region, and for Leeds office must live in or near Sheffield.

Housing assistance would be available in approved cases and a car would be provided.

Applications giving details of training and career should be made to MR. R. W. FLUX, DIRECTOR, BRUCE PEEBLES & CO. LTD., EDINBURGH, 5.

3101

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

Appointment of District Manager

APPLICATIONS are invited from suitably qualified candidates, with wide experience of the electricity supply industry, for the appointment of DISTRICT MANAGER in the Wrexham District.

Salary payable in accordance with National Joint Managerial, Grade 5, Class D (£2,380-£2,595).

Appointment subject to medical examination. Pension scheme.

Applications should be submitted to the Establishments Officer, Board Headquarters, Love Lane, Pall Mall, Liverpool, 3, so as to be received not later than 19th December, 1961.

3113

ASSISTANT EXPERIMENTAL OFFICER/ EXPERIMENTAL OFFICER

vacancies at ROYAL ORDNANCE FACTORY, BISHOPTON, RENFREWSHIRE. Duties: to deal with instrument work generally, such as calibrating, adjusting, testing, fault finding, commissioning, etc. The duties will be mainly on analytical and process control instruments.

Quals. and Exp.: Applicants should be qualified in Physics or Electrical Engineering for the Experimental Officer class and preferably have some experience in the foregoing duties.

Salary: Asst. Experimental Officer £450 10s. (age 18) to £776 (age 26 or over) to £983, starting salary according to age; Experimental Officer, minimum age 26, £1,057-£1,296.

Forms from Ministry of Labour, Technical and Scientific Register (K), 28, King Street, London, S.W.1, quoting A459/1A.

3071

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SECTION ENGINEER required in the Warrington District of the Board's No. 2 Sub-Area. Salary within range £1,190/£1,325 per annum (N.J.B. H/7, Scale 10).

Applicants must have received a sound engineering training and have experience in the construction and operation of overhead and underground distribution systems including indoor and outdoor substation equipment. A technical qualification is desirable.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 2 Sub-Area, Sandiway House, Northwich, Cheshire. Closing date 15th December, 1961.

3081

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

STATION SHIFT CONTROL ENGINEERS are required at Hams Hall "C" Power Station, near Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule A of the Agreement, Grade K.10, £1,115-£1,245 per annum plus 10% for shift duties.

A sound technical training and practical experience in the control of steam generating plant and main switchgear are required. Appropriate technical qualifications will be an advantage.

Apply, quoting Vacancy No. 281/61 MR, on form AE6, available from the Station Superintendent, Hams Hall Power Station, Lea Marston, Sutton Coldfield, Warwickshire, to be completed and returned by 11th December, 1961.

3080

GESTETNER LIMITED
Tottenham, London, N.17

require an

ASSISTANT ELECTRICAL ENGINEER

to take charge of Electrical Maintenance Department in their North London factory. Electrical consumption 2,500 kVA.

Applicants should be about 35 years of age and hold the H.N.C. in Electrical Engineering.

Applications to the Personnel Officer, Gestetner Limited, Fawley Road, Tottenham, London, N.17, or telephone TOTtenham 1050.

2925

SLOUGH ESTATES LTD.

APPOINTMENT OF

CHIEF ENGINEER

APPLICATIONS are invited for the post of CHIEF ENGINEER to Slough Estates Limited which is shortly becoming vacant.

The successful applicant will be directly responsible to the General Manager for the operation of the company's engineering department, including the electricity generating station at Slough of 50-MW installed capacity, and their electricity, steam and water distribution systems and engineering utility services at Slough, Birmingham and Greenford.

Applicants must be fully trained engineers and Corporate Members of the Institution of Electrical Engineers or the Institution of Mechanical Engineers. Experience of both technical and commercial aspects of the generation, distribution and sale of electricity is essential.

Age group preferred is 35/45.

Minimum salary of the post is £2,750 per annum, but a higher salary may be offered to a person with good qualifications and experience.

Other benefits include contributory pension scheme, generous life cover and provision of a car.

Applications should be made in writing on or before 22nd December, plainly marked "Chief Engineer, Slough Estates Co." giving full details of qualifications, previous experience, etc., to Preece, Cardew & Rider, 8-12, Queen Anne's Gate, Westminster, London, S.W.1.

3082

LONDON ELECTRICITY BOARD

Draughtsman

APPLICATIONS are invited for the above position in the Board's Eastern District at 84, Romford Road, Stratford, London, E.15.

Applicants preferably should be not less than 21 years of age and have had experience in mains recording work, be able to compile neat and accurate permanent records, and to undertake general duties appropriate to a District drawing office.

The post is graded within the National Joint Council Agreement (Administrative and Clerical Grades) as Grade 1, i.e., £600 to £700 per annum, plus the appropriate London Area allowance.

Applications should be sent to the Manager at the above address within fourteen days of the publication date of this notice. Please quote ref. PER/V/3264/R.

3095

CENTRAL ELECTRICITY GENERATING BOARD

South Thames Division

Kingston Power Station

ASSISTANT ENGINEER (Control) (Vacancy No. 285/61). Applicants should be interested in all aspects of station operation, and opportunity will be given for experience of higher grade duties.

Salary N.J.B. Class G, Grade 13, £845 to £935 per annum, including London and shift allowances.

Applications giving age, details of experience, etc., should be sent to the Station Superintendent, Kingston Power Station, Downhall Road, Kingston-upon-Thames, Surrey, to arrive by 7th December.

3105

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Region

East Midlands Division

General Assistant Engineer (Mechanical Maintenance) (Vacancy No. 246/61)
General Assistant Engineer (Electrical Maintenance) (Vacancy No. 247/61)

Staythorpe "A" and "B" Power Stations

APPLICATIONS are invited for the above vacancies at Staythorpe "A" and "B" Power Stations, near Newark, Notts.

Preference will be given to candidates who hold the Higher National Certificates or who are at present pursuing a course of study with the object of obtaining this or a similar qualification.

Salary will be in accordance with Class M, Grade 16 (£825 - £940 per annum) of the National Joint Board Agreement, and the positions will be pensionable within the terms and conditions of the electricity supply industry.

Closing date for receipt of applications, 15th December, 1961.

Applications, quoting appropriate vacancy number, should be submitted on the official form AE6/ACT, which may be obtained from the Station Superintendent and should be returned to him by the date stated.

O. S. WOODS,
Assistant Divisional Controller.
3107

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

ASSISTANT ENGINEER (Combustion) required at Coventry Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A of the Agreement, Grade G.7, £1,115-£1,245 per annum.

Applicants should be competent engineers and should have had good experience in the operating problems arising in power stations. Appropriate technical qualifications will be an advantage.

Apply, quoting Vacancy No. 287/61 MR, on form A.E.6, available from the Station Superintendent, Coventry Power Station, Aldermans Green, Coventry, to be completed and returned by 11th December, 1961.

3104

A NATIONAL INDUSTRIAL ELECTRICAL WHOLESALER

with an expanding organisation, is looking for a SENIOR SALESMAN with a dynamic approach to selling, and especially a man who is seeking advancement to management.

The appointment is in the Midlands and excellent prospects are offered to the right man, who should already be earning at least £1,000 p.a.

Apply, giving full details of career, to the Sales Director.—Box 3088.

ADDITIONAL supervising engineer for London contractor. One able to run contracts from inception to final accounts and be responsible to manager for same. Only person who has had several years' experience in similar capacity would suit. Good salary and prospects. —Box 106.

CONTRACT and estimating engineer required by established electrical contractors in the West Country. Experience in all branches of the trade and capable of controlling labour and finalising accounts necessary. Good prospects for the right person. Write with full details of experience, age and salary to—Box 3007.

ASST. branch manager reqrd. by elec. wholesalers, Luton district. Must have good knowledge of the trade and administrative ability. Apply in writing to — Secy., L.E.C., 92, Blackfriars Rd., London, S.E.1. 2976

BOOK-keeper, male or female. This is a responsible position and a good salary will be paid. Please state present earnings and when available. References would be required. —Box 107.

CHRISTY BROS. Limited of Chelmsford require a junior electrical engineer in their consulting section. Capable of planning and design services in all types of buildings including boiler house, etc., with the minimum of supervision. Salary according to experience and age. Full details to—Christy Bros. Ltd., Electrical Engineers, Chelmsford. 3068

ENGINEER required, male or female, with experience in production of lighting fittings and electrical installations, to take charge of estimating dept. Pension scheme; 5-day week. Salary according to ability and experience. Apply—Ionlite Ltd., 89, Scrubs Lane, London. N.W.10 (LAD. 2468). 3004

ESTIMATING and contracts engineer required by established electrical contractors in North Midlands. Opportunity for engineer with installation design experience in expanding company. Write giving details of exp. and age to—Box 8404.

ESTIMATING/supervising and/or design and also junior engineer required for progressive positions for high-class installation work in an expanding company. Write in confidence stating age, experience in detail and salary required to—Managing Director, Alliance Electrical, 2, Henrietta St., London, W.C.2. Progressive salary and scope for advancement for able and enthusiastic engineers. 137

ESTIMATING/supervising engineer required by old-established contractors operating in the West Riding of Yorkshire. Write in confidence stating age, experience in detail, and salary required to—Box 3073.

EXPERIENCED representatives, with contracting and user connections in South London, are required by a rapidly expanding electrical wholesaler. Successful applicants will be chosen by the 12th of February, 1962. Write in confidence giving age, education and experience to—Box ER.7660, c/o Whites, 72, Fleet Street, London, E.C.4. 219

JUNIOR technical assistant, age 20-28, for preparation of lighting schemes, illuminating engineering dept. manufacturers of lighting equipment. 5-day week. Pension fund. Apply stating experience to—Chief Engineer, Technical Service Dept., Holophane Ltd., Elverton Street, Westminster, London, S.W.1. 3058

MANAGER required for Preston branch of electrical wholesalers of repute. Must have knowledge of the purchasing and sales of industrial electrical equipment and domestic appliances, and of the general internal running of the electrical wholesale trade, to be conversant with terms applicable to the trade, and capable of dealing with all correspondence, quotations, staff, sales representatives, etc. Preferably men between the ages of 40-50. Reply stating age and giving full particulars of experience, etc., to the Managing Director, J. Walton (Electrical) Limited, Brunswick Mill, Bradford Road, Manchester, 10. 3059

PREFORMED LINE PRODUCTS (Great Britain) Limited, Andover, Hampshire, require additional technical representatives for North and South England. Applicants must be well introduced to the electricity supply authorities and willing to travel extensively. To the right men, these posts are permanent and progressive. Salary, expenses, pension scheme, and car provided. Write in confidence to the Sales Manager. 3084

REPRESENTATIVE, age not exceeding 30. previous knowledge not essential; must have elementary mathematical ability. Apply to — Managing Director, Standard Wholesale Electrical Co. Ltd., St. Michael's Road. Croydon. 2006

REPRESENTATIVE required by leading electrical and radio wholesaler for area within 15 miles radius of Grange-over-Sands. Experience, ability to work on own initiative and residence within the area are essential. Remuneration by salary and commission; a company car is available if required.—Box 3111.

REPRESENTATIVES required London and Home Counties to sell a well-catalogued modern range of competitive tungsten lighting fittings to architects, wholesalers, contractors and large users. Salary, commission and expenses.—Box 2979.

REPRESENTATIVE required by leading electrical wholesaler for South Manchester and Cheshire area. Experience in calling on industrial users is essential and knowledge of the area would be an asset. Remuneration by salary and commission, company car available. —Box 3110.

RESIDENT site engineer/supervisor for mechanical and electrical engineering services contracts at University College of North Staffs, Keele. Applicants should have sound practical knowledge of this type of work; and technical qualifications, preferably in electrical engineering, will be considered an advantage. The appointment will be for several years, and salary in accordance with age and qualifications. Apply—Hoare, Lea & Partners, 23, St. James Road, Birmingham, 15. 3074

SENIOR estimating engineer req., experienced in all types of installation work, capable of controlling labour and handling contracts to final account stage. Good opportunity for right man to become assistant to manager. Write stating details of exp., age and salary to—F. H. Wheeler (Bristol) Ltd., 37, Victoria St., Bristol, 1. 3006

SUPERVISING electrical engineer required by large electrical company. Preference will be given to applicant with experience of power station cabling, including design and erection of supporting steelwork. Good knowledge of cable jointing and testing essential. Write stating age and giving details of previous experience to—Box 3018.

WORKS manager required by expanding company in N.E. specialising in armature rewinds and mechanical repairs. The post offers an alert man unique opportunity for advancement. Replies in confidence to Managing Director.—Box 3112.

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

A SENIOR project engineer, A.M.I.E.E. Development light and medium products. Instruments. Domestic. Testgear. New successful ideas and production improvements. Surrey approx. Now.—Box 8369.

ADVERTISER seeks position. Experienced in outside sales representation and sales office. Good knowledge of electrical trade. Used to estimates and quotations in the switchgear field, dealing with consultants, architects. Own car.—Box 8402.

A.M.I.E.E. (47), at present general manager with small firm, seeks new post. Formerly with both medium and very large firms in managerial capacity. Medium and light engineering (not electronics as yet), covering design and sales in wide aspects of heating, lighting, control panels, site supervision, etc. References will confirm loyalty, balanced judgment, hard worker and value generally. Resident London. Min. starting salary £1,500.—Box 8406.

CHARTERED engineer (39), resident Manchester, with representative/design experience, seeks responsible position.—Box 8390.

DEVELOPMENT engineer (40), university graduate, A.M.I.E.E., wide knowledge of power systems, network analysers, analogue computers, Doppler radar systems, induction communication systems. Available now.—Phone ELMbridge 2724, or write to Box 8393.

ELECTRICAL engineer (40), H.N.C., A.M.A.S.E.E. Exp. industrial plants contracting, home and abroad. Position preferred Europe or overseas. Fluent German spoken.—Box 8399.

ELECT. engr. (26), H.N.C., interested in A.C./D.C. rotating mach. design or development, seeks post London. Training received motors, transformers.—Box 8386.

ELECTRICIAN (41), ex Middle East, seeks further overseas employment, contracting, large and small installations, int. and external. —Box 8382.

ELECTRICIAN seeks further employment overseas.—Box 8394.

ENERGETIC man, early thirties, only interested in a modern forward-thinking organisation in the electrical field, seeks a position as a sales manager. Qualifications, enthusiasm, ability. Grad. I.E.E.—Box 8400.

***Situations Wanted** (continued)*

EXP. est/sup/engr. (elec-cont.) desires progressive post, London or South.—Box 8403

TECHNICAL/electrical/mechanical engineer, A.M.I.E.E. Exp. executive, design, development, tech. sales advisory, production, management, in electromech. products, machines and switchgear, etc. Location pref. Essex/London. —Box 8388.

TOP-grade representative, electrical heating. Scheme design and sales. Resident Midlands. Agency considered.—Box 8391.

ARTICLES FOR SALE

ELECTRO MOTION LIMITED

offer from their extensive stock :—

BRAND NEW "Chorehorse" Portable Lightweight Petrol-driven Alternating Sets, 225 watts, 230 volts, single-phase, 50 cycles A.C., electric and rope start, comprising single-cylinder, 4-stroke air-cooled petrol engine, direct coupled to alternator with control panel. With spares and complete set of tools. Separate battery charging output.

IDEAL FOR TELEVISION, RADIO, IN BOATS, CARAVANS, HOUSES, etc.

PRICE £49 each ex works.

312.5-watt VILLIERS/EDC Petrol-driven Portable Alternating Sets, comprising Villiers Mark 10 single-cylinder, 4-stroke, 1.3-h.p. air-cooled petrol engine, belt driving EDC alternator, 230/1/50, A.C., 3,000 r.p.m., .9 power factor, self-exciting. On light bed plate.

IDEAL FOR TELEVISION, RADIO, etc. 1.2 amps. First-class condition.

PRICE £35 each ex works.

Write for photographs and stock lists containing generators, diesel engines, electric motors, tractors, etc., to :—

ELECTRO MOTION LIMITED
Barkby Road, Leicester
(Tel. 66341, 5 lines)

305

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Region

1,500-kW B.T.H. Motor Converter (in Good Condition) for Sale

THE Motor Converter may be inspected upon application to the Station Superintendent, Foss Islands Power Station, York (York 22728) during normal office hours.

Tenders should be sent to the Regional Secretary, Central Electricity Generating Board, North Eastern Region, 1, Whitehall Road, Leeds, 1, not later than Wednesday, 13th December, 1961, the envelope to be endorsed "Tender Reference No. 360.00/285."

3109

UNUSED ALTERNATORS FOR SALE

Frustrated Exports

	kW	r.p.m.		
One	130	600/720	3ph./50/60cy.	380 v.
Two	132	720	3ph./60 cy.	380 v.
One	346	600	3ph./50 cy.	415 v.
One	310	750	do.	do.
Four	110	600	do.	400/440v.
Three	225	600	do.	3.3/6.6kV
Three	620	750	do.	3.3 kV

All single-bearing machines for direct coupling. Makers' guarantee. Very low prices.

FYFE, WILSON & CO. LTD., Engineers
Bishop's Stortford, Herts.
(B.S. 1000/1/2)

162

A.A. ELECTRICAL Co. for A.C.-D.C. motors, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—CHI. 5105. 67, Rothschild Rd. London W.4. 57

WESTINGHOUSE

BATTERY CHARGERS available for immediate delivery from stock—wide range of models to suit requirements of industry. Write for leaflet 11.BC.10, or for urgent attention telephone London Terminus 6432, Birmingham Midland 5507, Manchester Deansgate 3664, Glasgow Central 1520 or Newcastle 23181.

WESTINGHOUSE BRAKE AND SIGNAL CO. LTD.-82 YORK WAY, LONDON N1

208

ALWAYS SPECIFY AND USE

PORTAWAY
(REGD.)

FOR ELECTRICAL SAFETY
2 NORTH PARK ROAD
HARROGATE
YORKS
T.A. PORTAWAY · T.N. 3853

EARTHING EQUIPMENT LIMITED

TINNED COPPER TAPE
'FULGRIP' BONDING CLAMPS
and 'DYROD' EARTH RODS

Good delivery—send for illustrated Price List

144

HOUSE SERVICE METERS

200-240-v. A.C. or D.C., 10 amps. capacity, quarterly type, from 25s. each, plus 2s. 6d. carr.

UNIVERSAL ELECTRICAL CO.
221, City Road, London, E.C.1 37

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

A.C. and D.C. slotmeters and quarterlies. Reconditioned, guaranteed 2 years. Repairs and recalibrations.—Victor Electric Co., South View, Sweet Hill, Patcham, Brighton, Sussex. 8336

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 600 kVA.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (CLErkenwell 5512). 24

ALTERNATORS and generators, all types up to 150 kW.—Powerco Ltd., 312, York Road, London, S.W.18 (VAN. 5234). 151

BARGAINS in electric motors from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Ring Monarch 3355. 50

BRAND new and unused, ex makers' works: 6 off 1,100-amp. and 15 off 300-amp. type "E" Ellison circuit breakers, ex-stock delivery. Apply — Slaters Electricals Ltd., T.V.T.E., Gateshead, 11. 3085

CABLE, armoured, P.I.L.C., P.V.C., R.I.L.C., V.C.I.L.C. All sizes in stock at our London works. Cutting and delivery same day as order received. Priced stock lists.—Batt Electrical Co., 6, Dock St., London, E.1 (Tel. Royal 5905). 316

CIRCUIT-breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards. — Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS, motor-alternators, motor-generators, frequency changers, etc. All types up to 100 kW.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

DIESEL generating sets, all sizes to 500 kW. Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

ELECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

ELECTRIC motors, generators, motor generator sets, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, "Electrical Surplus," containing thousands of items of electrical plant, sent on request.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 54

ENGLISH Electric Co. 900-kVA turbo-alternator set with accessories, 415 volts, 3-ph., 50 cycles.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 3086

FLUORESCENT tubes reconditioned and guaranteed with a life as new from 7s. 6d. each. Free collection and delivery in Lancs and Yorks. We are also manufacturers of top quality fluorescent fittings, trunking systems, control gear and new fluorescent tubes. Generous discounts available.—Anglo-American Electrical Company, Olive Street, Bury (Telephone, Bolton 27251). 212

FOR sale, good unused and used machinery including electric motors, A.C. and D.C. dynamos, alternators, transformers, diesel and steam electric generating sets, mains failure sets, motor generator and Ward Leonard sets, switchgear, compressors, fans, capacitors, etc.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford, Herts (Tel. B.S. 1000/1). 161

GEARED motorised units. If the call is urgent within the fractional range, phone CLE. 4141.—Jeary Electrical, 132, East Road, London, N.1. 127

GENERATING sets, portable or stationary, new and reconditioned, 1 to 100 kW, A.C. and D.C. — Powerco Ltd., 312, York Road, London, S.W.18 (VAN. 5234). 148

GET your Collins Electrical Engineers' Diary now! Invaluable reference book of basic data for designers, technicians, plant and installation engineers. Available from all stationers in many bindings from 5s. 6d. to 8s. 6d. 3060

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COMPANY MEETINGS

STERLING CABLE COMPANY LIMITED

HIGHER OUTPUT OFFSETS RISING COSTS

Mr. James S. Clark on Satisfactory Current Order Book

THE 13th Annual General Meeting of Sterling Cable Company Limited was held on 24th November in London, Mr. James S. Clark (chairman and managing director) presiding.

The following is his circulated address:—

Ladies and Gentlemen, I have the pleasure to submit the Report of the Directors and Accounts of the Company for the year ended 31st March, 1961.

The Group profit, before tax, was £70,468, compared with £53,129 last year. Income tax requires £29,855. The Group profit, after tax, is £40,613, out of which we have provided for Preference Share redemption £5,772, and for the Preference dividend, less tax, £0,112. The recommended Ordinary dividend of 7½%, less tax, will require £18,605, leaving £10,124 to add to our carry forward, which now totals £79,014.

Profit Margins

Last year I told you of the healthy state of our Order Book—the exceptional range of types of cable for the Export and Home markets. As the year progressed it became apparent that the level of prices at which these orders were booked, although improved, still left much to be desired. A considerable portion of our business is taken at firm prices (except for metal variations), which means that all increases have to be absorbed by, and so decrease, the profit margin. There was a steady increase in operational costs throughout the year. Happily we were able to offset the full effect of these rising costs on our contracts by greater and more efficient output.

Our Order Book remains satisfactorily varied and adequate—output is at an all-time high. Profit margins are still below the 1958/59 level, modest as those margins were. We are optimistic that the results for the current year's trading will again show improvement.

Export Market

Export continues to be our main preoccupation, and is responsible for approximately half our output. We have been entrusted with the requirements of power, control, and instrumentation cables for many overseas projects of great size and complexity, and again it is our privilege to express our thanks to the Consultants and Contractors concerned for their continued splendid support. The enthusiasm of our staff and operators combined with the compactness and flexibility of our organisation makes it possible to solve the problems constantly met with in the Export market.

The cable industry has to move in front of the times. It must play its part in providing that vital necessity—cheap power. This means constant technical and practical development, the use of new materials requiring new plant and modern methods. Such developments cannot be realised unless there are reasonable profit margins stemming from stabilised trading conditions. Let us hope that goodwill and good sense will create and preserve these essential conditions.

Our team has once again demonstrated both efficiency and goodwill, and I know you join with me in passing on our high regard and warm appreciation.

The report and accounts were adopted.

3052

INDEX TO ADVERTISERS

A.E.I. Lamp & Lighting Co. Ltd. ...... *Cover 4*
Adcola Products Ltd. 76
Aircraft-Marine Products (G.B.) Ltd. 21
Anglo Carbon & Contacts Ltd. 88
Ascot Lamps & Lignting Ltd. 57
Asquith Electrics (Colne) Ltd. 40
Associated Electrical Industries Ltd. ...... 5 & 44

Backer Electric Co. Ltd. 28
Berry's Electric Magicoal Ltd. 46
Bill Switchgear Ltd. 3
Birmingham Mica Co. Ltd. 64
Boxall, T. A., & Co. Ltd. 66
Brentford Transformers Ltd. 52
British Brown-Boveri Ltd. 50
British Insulated Callender's Cables Ltd. 19
British Klockner Switchgear Ltd... 72
Brook Motors Ltd. ...... *Cover 1*
Bruce Peebles & Co. Ltd. 9

Carr Fastener Co. Ltd. 7
Carr, James W., & Co. Ltd. 66
City Electrical Co. 90
Collins Electrical Ltd. 6
Contactum Ltd. 62
Crater Products Ltd. 20
Critchley Bros. Ltd. 58
Crompton Parkinson Ltd. ...... 61 & 73
Cumberland Engineering Co. Ltd... 72

Denhams (Norwich) Ltd. 75
Donovan Electrical Co. Ltd. 25
Drayton Controls Ltd. 48
Drummond, John (Engineers) Ltd. 62
Du Pont Co. (U.K.) Ltd. 49

East London Mica Works 60
Electricity Services Ltd. 84
Electro Dynamic Construction Co. Ltd. ...... *Cover 2*
Elliott Bros. (London) Ltd. 32
English Electric Co. Ltd. ...... 10 & 22
Erskine, Heap & Co. Ltd. 15

Fafnir Bearing Co. Ltd. 18
Ferranti Ltd. 31
Field & Grant Ltd. 43

G.W.B. Furnaces Ltd. 23
General Electric Co. Ltd. 63
Glover, Stephen, & Co. 66
Glover, W. T., & Co. Ltd. 34
Grelco Ltd. 69

Hall Electric Ltd. 40
Harmsworth, Townley & Co. 8
Hawke Cable Glands Ltd. 59
Henley Burrowes & Co. Ltd. 70
Hiatt & Co. Ltd. 60
Hildick & Hildick 60

Iliffe Books Ltd. 70

Kent, Wm. (Porcelains) Ltd. 18
Keyswitch Relays Ltd. 1
Klockner-Moeller England Ltd. 67

L.E.P. Cable Cleats 88
Lancashire Dynamo & Crypto Ltd. 56
Lead Development Association 70
Legg (Industries) Ltd. 16
Lindsay & Williams Ltd. 20
Litholite & Insulators & St. Albans Mouldings Ltd. 58
Londex Ltd. 14
London Electric Firm Ltd. 28
Long & Crawford Ltd. 36

M.K. Electric Ltd. 17
Magnetic Controls Ltd. 74
Martindale Electric Co. Ltd. 62
McGeoch, Wm., & Co. Ltd. 65
Mek-Elek Engineering Ltd. 43
Mercury Switch Mfg. Co. Ltd. 68
Metallic Seamless Tube Co. Ltd. ... 74
Metway Electrical Industries Ltd.... 68
Midland Electric Mfg. Co. Ltd. 53
Mole, M., & Son Ltd. 76
Monmore Tubes Ltd. 64
Morganite Carbon Ltd. 2

Neco Geared Motors Ltd. 41
Nelson, W. & H., Ltd. 32
Newton Bros. (Derby) Ltd. 90

Parmiter Hope & Sugden Ltd. 54
Parsonage, W. F., & Co. Ltd. 90
Philips Electrical Ltd. 37
Pirelli-General Cable Works Ltd... 24
Plant Engineering Co. Ltd. 88

Revo Electric Co. Ltd. ...... 38 & 39
Reyrolle, A., & Co. Ltd. 4
Rowlands Electrical Accessories Ltd. 11
Runbaken Electrical Products Ltd. 62

Sangamo Weston Ltd. 46
Savage Transformers Ltd. 12
Saxonia Electrical Wire Co. Ltd. ... 72
Service Electric Co. Ltd. 51
Sheen (Nottingham) Ltd. 72
Simplex Electric Co. Ltd. ...... 33 & 47
Sims, F. D., Ltd. 40
Smith, Frederick, & Co. 13
Southern Trade Services Ltd. 70
Square D Ltd. ...... *Cover 3*
Standard Telephones & Cables Ltd. 35
Sterling Cable Co. Ltd. (Company Meeting) 87
Sterling Varnish Co. Ltd. 29
Sturdy Electric Co. Ltd. 58

Taylor Tunnicliff & Co. Ltd. 71
Thew, Edward H., Ltd. 16
Transformer & Electrical Co. Ltd. 60
Troughton & Young (Lighting) Ltd. 55
Tufnol Ltd. 42
Turners Asbestos Cement Co. Ltd. 30

Universal Electrical Co. 90

Varilectric Ltd. 51
Vosper Ltd. 68

Watson, R. & W., Ltd. 70
Webber, R. A., Ltd. 90
Wessex Industries (Poole) Ltd. ... 40
Wiggin, Henry, & Co. Ltd. ..... 26 & 27
Willesden Transformer Co. Ltd. ... 66
Wootton & Co. Ltd. 69

Yorkshire Imperial Metals Ltd. 57

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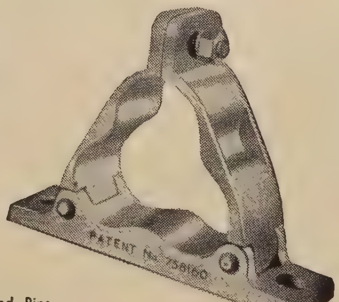

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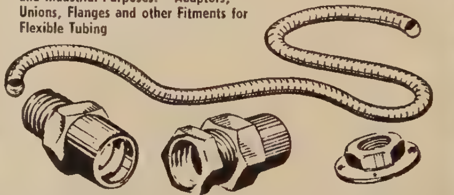

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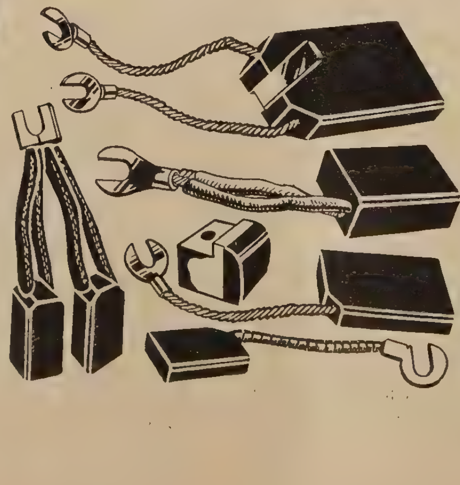

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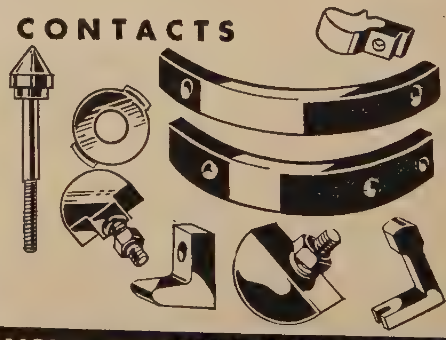

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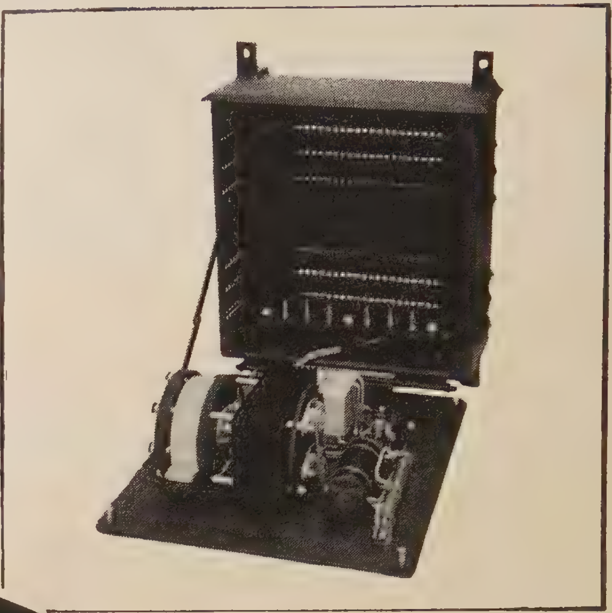

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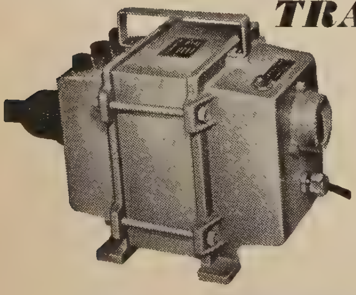

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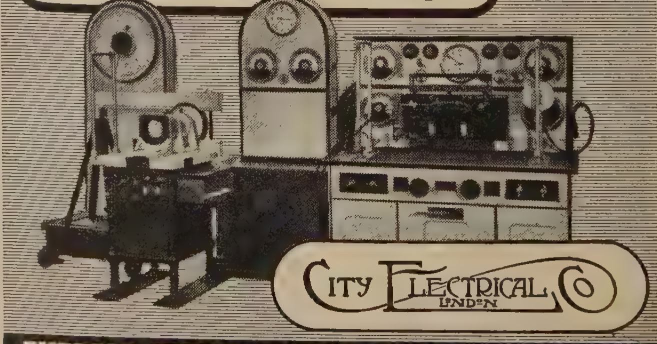

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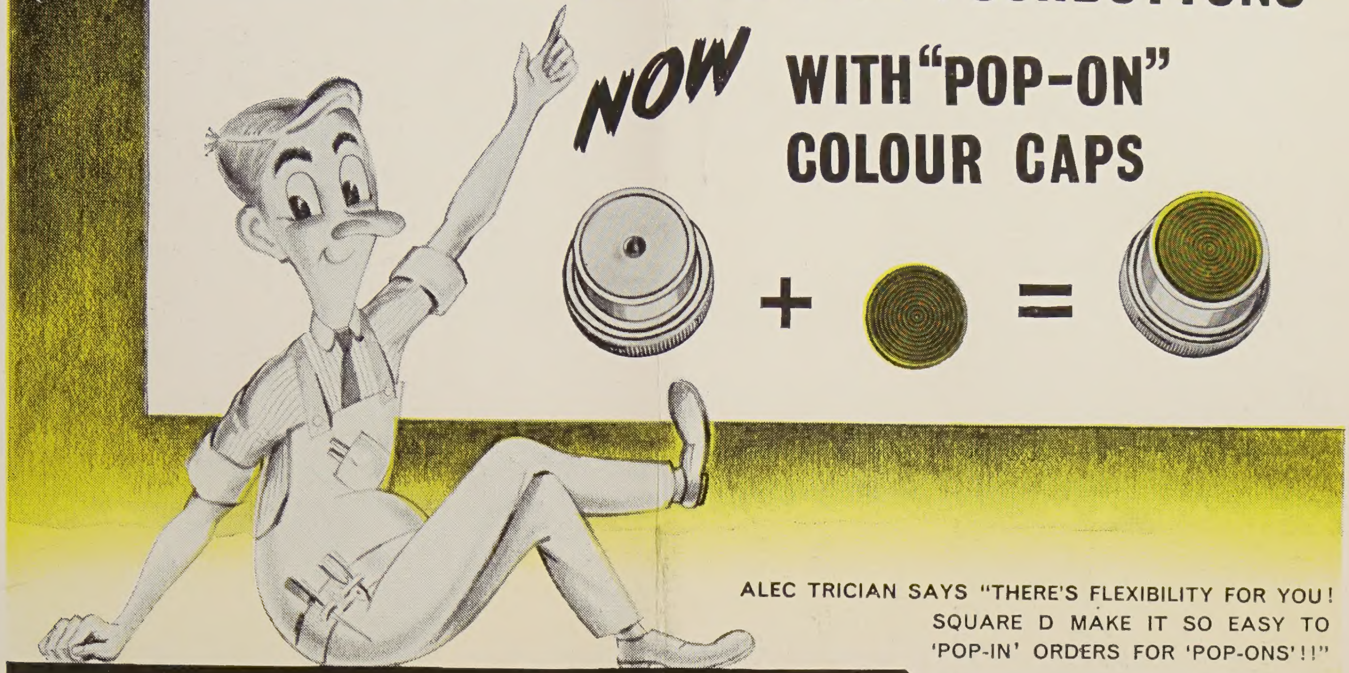

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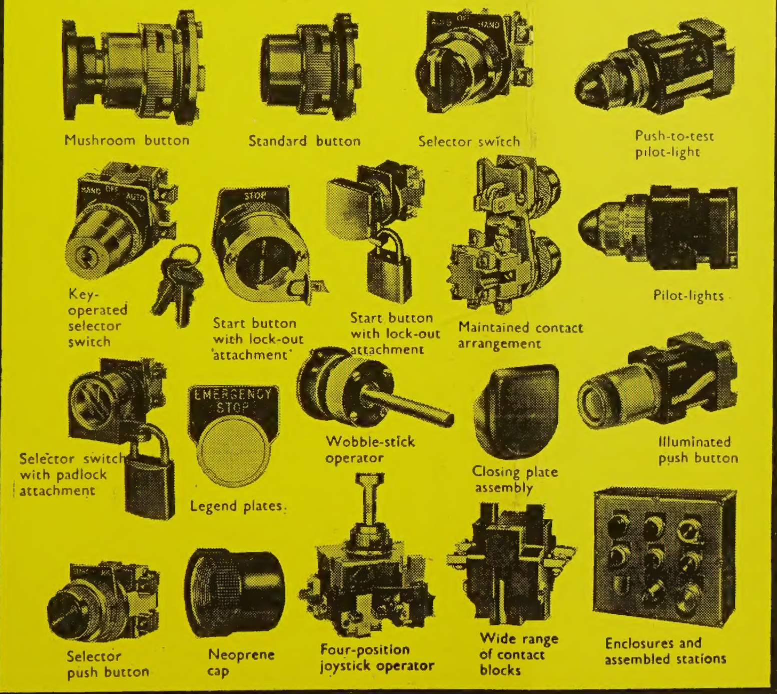
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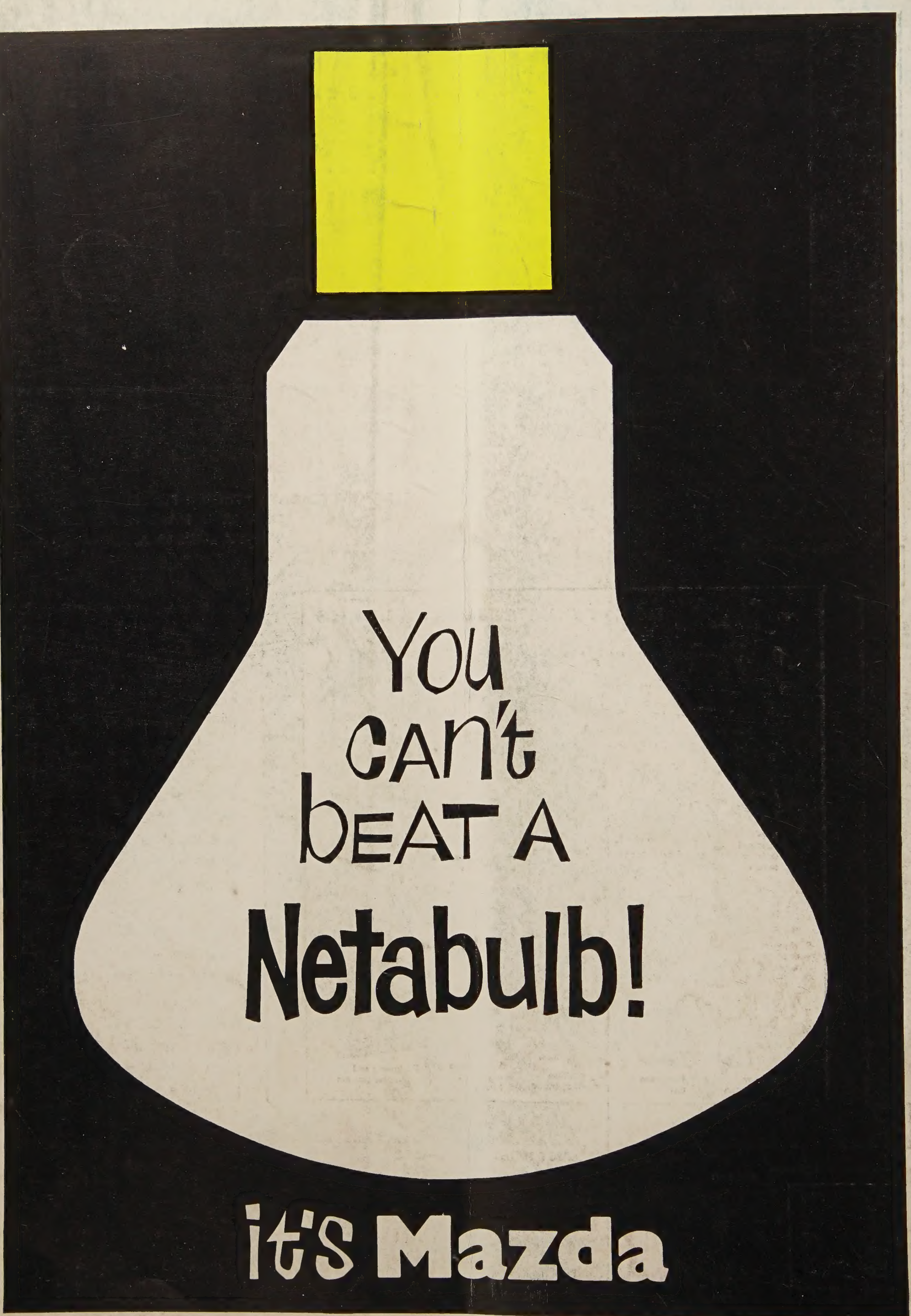
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